SOIL AND WATER CONSERVATION

Volume 15, No. 2

March • 1960

Writing and Science Presentation

Land and Water Use By Regulation

Watershed Management

Agency Communication

Wind Erosion Control

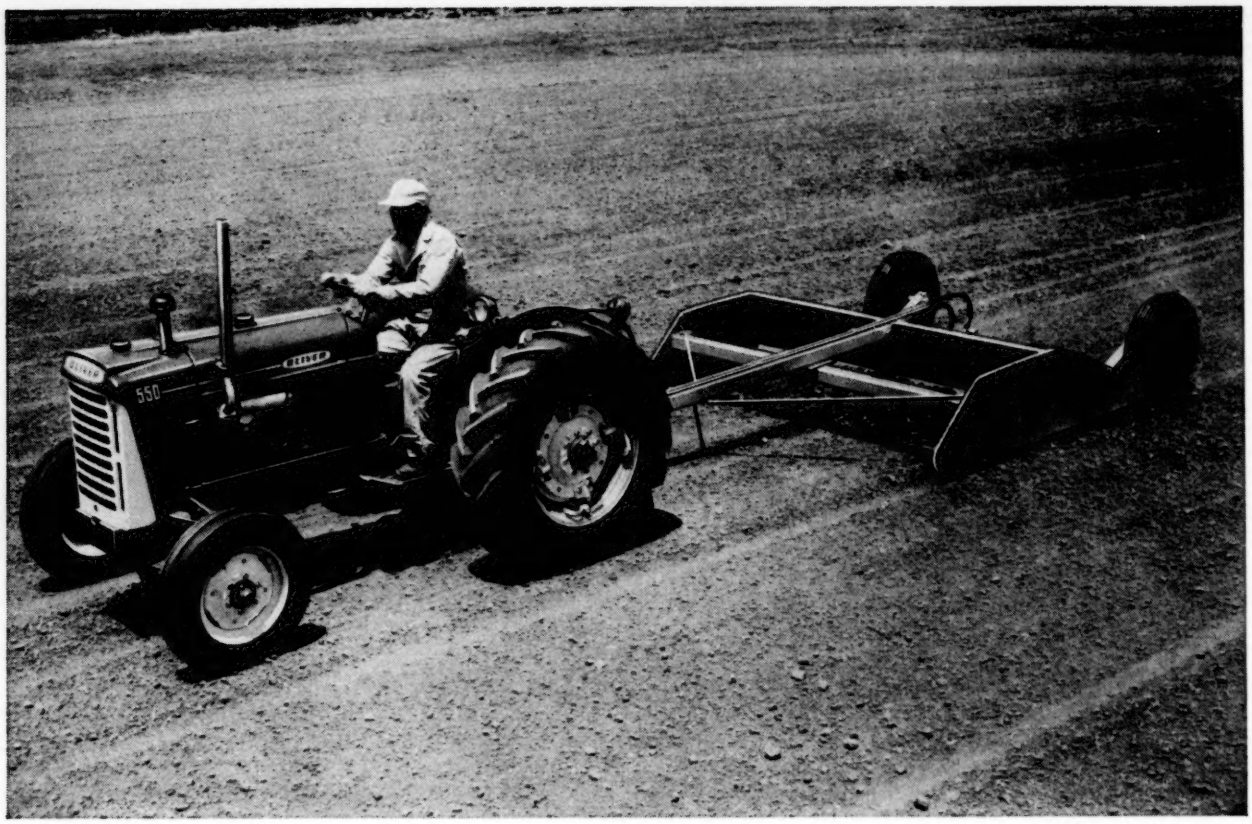
Minimum Tillage

Recent Literature

Society News

Advance Registration Form—15th Annual Meeting—Page 87

SOIL CONSERVATION SOCIETY OF AMERICA



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JOURNAL OF SOIL AND WATER CONSERVATION

VOLUME 15
NUMBER 2

TO ADVANCE THE SCIENCE AND ART OF GOOD LAND USE

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CHANGE OF ADDRESS: Notice of change in address should be received two weeks before the date of issue on which the change is to take effect. Both the old and the new address should be sent to the Executive Secretary.

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Contents for March, 1960

Writing and Science Presentation
WATSON DAVIS 53

Training Tomorrow's Scientists for Resource Development
HOWARD A. MEYERHOFF 56

Soil and Water Conservation By Regulation
J. W. DE ZEEUW AND P. J. ZWERMAN 60

Some Effects of Land Use and Treatment on Small Single Crop Watersheds
J. L. MCGUINNESS, L. L. HARROLD, AND F. R. DREIBELBIS 65

Communication in a Forestry Agency
KENNETH J. SEIGWORTH 69

How to Determine Required Width of Field Strips to Control Wind Erosion
W. S. CHEPIL 72

Renewing Permanent Pastures with Minimum Soil Tillage
A. E. PETERSON 76

Field Notes 79

Reviews and Literature Briefs 82

Society News Notes 85

Chapter News 90

News of Members 91

COVER: The science and art of land use starts in our minds. Soil tests are just one of the many tangible services that land-interest agencies and organizations provide to land owners, both rural and urban. Each "tangible" contact with the land is a "starting point" to increase one's perspective and understanding of the meaning of the land.

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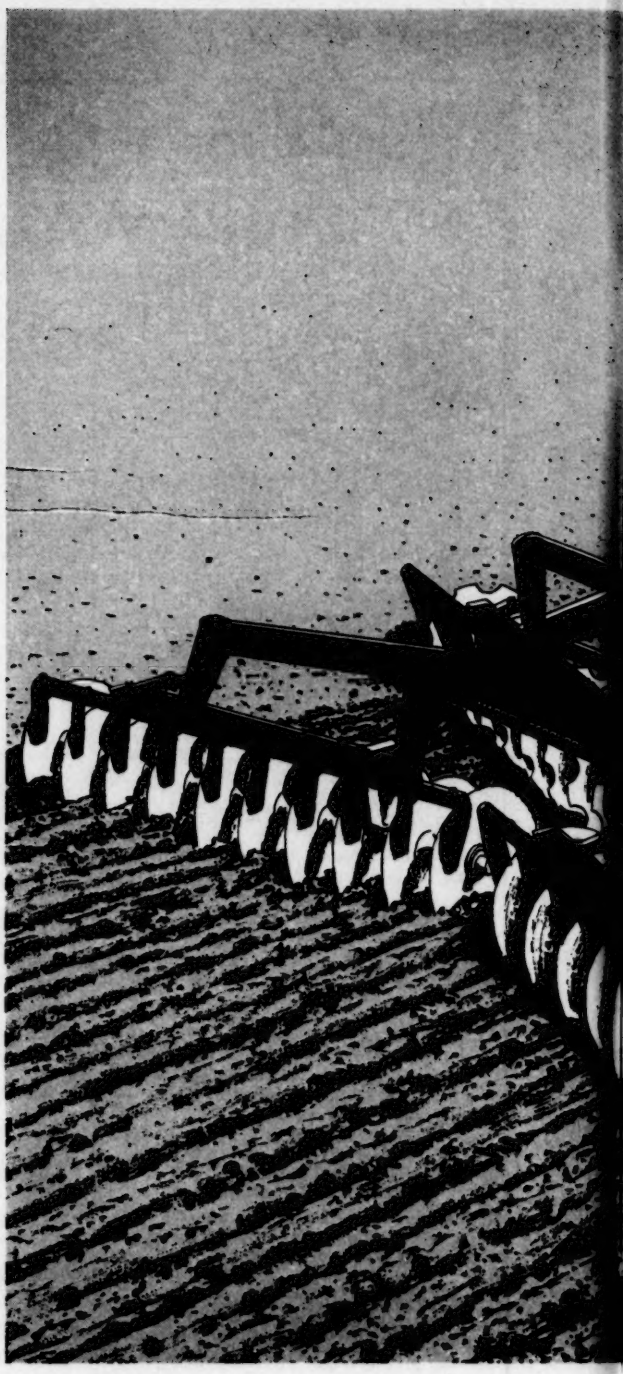

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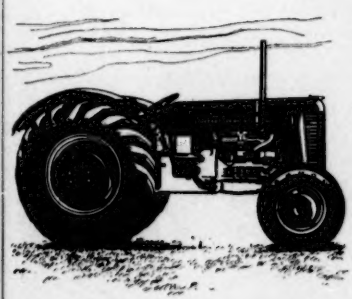

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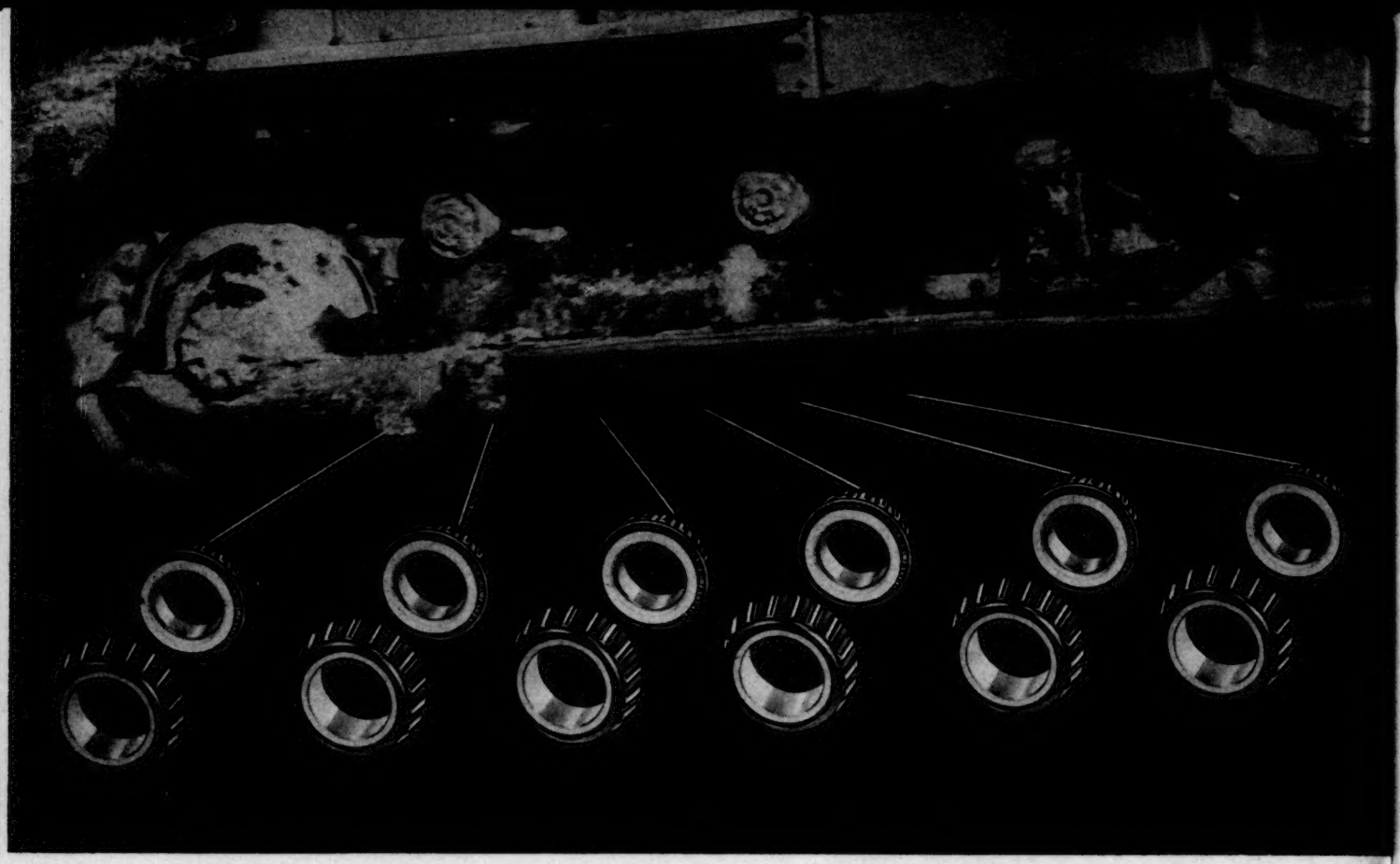

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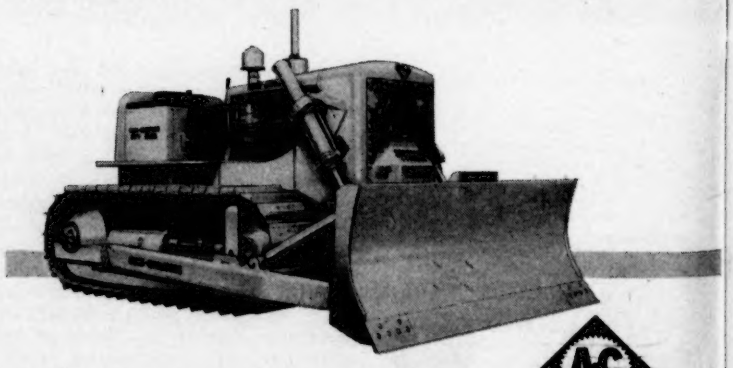

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Writing and Science Presentation

WATSON DAVIS

Here a leader in science interpretation is concerned with the role of writing. His questions and suggestions cut across the entire field of conservation. Recently a survey was directed at a 10 per cent sampling of Soil Conservation Society of America members concerning the JOURNAL. From a first examination of a substantial number of early returns of this survey, there is a strong indication that Dr. Davis' article needs to be read and taken to heart.

Dr. Watson Davis is Director, Science Service, 1719 N Street, N.W., Washington 6, D. C. This is a summary of his paper given before the Conference on Scientific Communication of the American Association for the Advancement of Science, Chicago, Illinois, Wednesday, December 30, 1959.

AFTER KNOWLEDGE IS GAINED, it must be distributed to those who can use it. We shall not argue about which is more important, creation or use. Both are.

Your job and mine are to communicate. We do this largely with words, which fit the material and the minds of those we are attempting to reach.

These words take various forms. They are scanned by the recipient from slick paper and newsprint alike. They are heard on radio and heard and seen on TV. They are not necessarily reduced to writing, although most of the verbal messages received by a mass audience become written matter somewhere in their transmission, even if delivered by radio or TV. They are passed on by word-of-mouth in ordinary conversations, often distorted and changed. They reverberate in human minds, often unspoken and unwritten but nevertheless motivating.

Human imagination and experience paint mental images out of words. Mental pictures are more vivid than real ones in many cases. The great art in telling is to make the words mean what you want them to, not in your own mind but the minds of others.

Such are the objectives of the techniques that we use to pass on the factual and emotional content of what we have to convey and say. How to do it is quite another matter. That is a mixture of art and technique, with a dash of science perhaps.

Three Intelligent Levels

There is the problem of the level of communication. Let us differentiate at least three intellectual levels.

1. Most artificial, and perhaps the most precise, is the kind of writing that is from specialist to specialist, professional to professional, using special vocabularies and a minimum of synonyms and imagery. This is the style and verbiage of the technical paper conveying original, or presumably original, creative knowledge. As stylized as a religious ritual in cadence and aspect, this is the holy of holies in intellectual communications. Whether it needs to be is another question to be considered later.

2. The serious but not so technical writing, that one professional does for the enlightment of another professional species of Homo, may not be so difficult but it is hardly the way to talk to the general public. It can be used to cross intellectual categories, such as science to art, art to economics, sociology to religion. Some of the "fine" literature comes into this level.

3. May we put together into a third division most of the communication in the world: exposition of newspapers, magazines and books, fiction, the accelerating oral messages, comic strip balloons, advertisements, and almost everything else designed to catch a roving and unwary eye and mind. We are most concerned with that portion that has to do with conveying the kind of information that translates the technicalities of the first two levels into the languages of everyday living. This is action stuff for intelligence. We who believe we have the right approach are convinced that the world rises or falls depending upon how well we do this job. We must believe this, I presume, if we are to be effective.

Too Little Experimentation

There is often too much preoccupation with techniques. There often is too little experimentation. There may be too much concern with the how and not enough with the what.

If the potential reader has learned to read, there is very little need for writing down. This is demonstrated by the daily newspaper which serves children and old folks alike. Clearness and vividness are more needed than vocabulary limitations based on word lists.

These are matters of techniques. What stands in the way of reaching the public?

There is one great competitive barrier to telling the world about the factual and motivating information that is produced by a wide range of intellectual endeavor.

It is interference from the skillful and blatant pronouncements of those who have something to sell. This may be a strident, repetitive radio or TV announcement. It may be the carefully planned, low-level, but constant repetition in angled newspaper reporting of one particular brand of politics. It may be the subtle word-of-mouth persuasion which is effective because it corresponds so accurately to the vibration of human emotions generated by a general situation.

Today the pressures upon human action, thoughts, emotions and motivations are extremely intense. Television with relative recentness has added another source of emotional influence. To a more limited extent, it has added another source of information. We have seen the techniques used in television commercials change and develop. Highly scientific criteria are used for measuring effectiveness. What is more scientific than a sales curve for a ballyhooed product? High-level appeal, replete with sound intensity and sight movement are used to squeeze the last drop of consumer acceptance and action from the least possible seconds of the expensive rich filling between entertainment beamed out in sight-sound layers of time.

Within Our Electronic Lifetime

Although electronically born within the lifetime of most of us, radio is a bit vulnerable compared with TV. Yet it plays its part in insisting to the American public that they believe what the entrepreneurs want them to believe. Not demanding full attention, the commercial can be sandwiched among good music. An individual may very well be confident that he can apply his own squelching apparatus to the commercial that he does not really want to hear. Do not rely on such self control. Repetition of the commercial and association of the advertised product with something desired and acceptable will make its way into your subconscious and thus do its insidious sales work.

Books are of much lower level of insistence, extent of exposure and persons reached. Even the most successful plastic-covered reprints do not have the impact of a single magazine issue or a top spectacular.

The persistence of the book is in its physical format. It is difficult to destroy or discard. Almost anyone has the impulse to rescue a bound book from the trash heap. Book burning is intellectually repugnant. This almost sacred character of books often serves to perpetuate what is wrong or obsolete, but it also protects continuing truth from the ravages of time. Books are vaults for knowledge. If only they could combine safe-keeping with ease of use.

Most people today would guess that Chautauqua is a new kind of cigarette. The enlightening effect of the lecture circuit has been reduced to university campuses, service club luncheons and women's club programs.

Under the primary incentive of selling, the daily newspaper is changing its dress and mode of operation. It is fighting fiercely against the TV and radio competition. Color has joined black ink, primarily in the advertisements, but is creeping symbiotically into the reading matter. No major new techniques have appeared in a matter of written presentation of information in the newspapers presumably because the technique is relatively effective. There have, however, been refinements. Types are more readable. There is greater use of more effective illustrations.

Magazines, too, although there are fewer of the big ones than there used to be, are distributed in larger numbers than ever, even giving consideration to the increasing population. They, too, feel the menace of television, but the beautifully printed pages, which may rely upon a nearly nude feminine figure to purvey anything from a motor car to a breakfast cereal, have a quality of persistence that, despite the relative impermanence of a periodical, outstrips the flickering image in darkened homes.

The serious content of comic books and billboards is hardly worth mentioning.

The pulpit has lost its punch.

More Fundamental Information

In the size of distribution and the individuals reached, we may have some right to be pessimistic about the effect of educational, economic, scholarly and scientific publications. From the standpoint of the carrying of the essential continuity of human intelligence from person to person and from generation to generation, these publications are the essential medium.

More and more of the population must become interested in the more fundamental and essential information about civilization, facts, conclusions and content of our physical, biological and social sciences, and our economic developments. There is greater need for these hard cores of intellectual life to be presented attractively and readably. With the increase in the volume of human knowledge, it is important that what we need to equip ourselves with for living and producing shall be assimilated and understood in the least possible time. There should also be a high enjoyment factor in the process in order that it may become acceptable to more and more people. We must make knowledge and learning sufficiently attractive, emotionally and intellectually, that more and more of the population will break away from the neo-entertainment of the popular media, such as television and radio. This is a large order, for it involves motivated intellectual participation, as well as effort and capacity.

There is a good deal of loose talk abroad in the land about leisure time. This so-called leisure time is too often misspent time or loafing time. The youth who

has excess leisure time is not doing his share in the world. Home, school or both have failed.

It is true that people are living longer. Perhaps they will have, as a consequence, more time in their later years, if they can maintain their physical and intellectual vigor, to utilize what they have learned or go on learning further. The new slogan perhaps should be: "Life begins at sixty—if you are willing to work like sixty." This presents the opportunity for a second intellectual youth which can pay off handsomely for the civilization in which we live. While it is perfectly true that many of the great discoveries of the past have been made by very young people, in their twenties in many cases, it is also true that people like Galton (finger prints) and many others have made equally important contributions to knowledge when they were beyond three-score years.

Too Stylized Writing

There should be careful attention given to the intellectual class of material, represented by books, bulletins, pamphlets and the less popular magazines. These publications need the same kind of attractive treatment typographically and publication-wise as the more extensively circulated materials. They too need and deserve the kind of writing that can be understood. Real progress is being made in this respect. But the greatest progress will be made when it becomes fashionable among scientists, economists and other experts to write, not with impressive obscurity, but with helpful clarity.

Technical or intellectual writing is stylized beyond all reason. *Technical* writing is actually taught. There are national societies devoted to it. It can be argued, no doubt, that this is good and useful.

What would happen if a scientist did *not* find the gist of a technical paper in the *last* paragraph and the history in the first part? It would indeed be confusing.

Yet I want to suggest that some of the principles of newspaper and advertising writing be applied to technical writing, even to the articles in journals of original publication. How novel it would be to read in the *beginning* of the article what has been found! What would the technical person think if newspapers wrote their stories the way his journals are written? Is the form of technical presentation a bit of unconscious snobbery? It is prestigeful to be difficult to understand, just as some doctors still write prescriptions in Latin.

In persuasive advertising, born of Madison and equivalent avenues, occasional effective devices appear that may be captured to explain and sell ideas and knowledge as effectively as they sell goods for dollars. Do not look with disdain upon new methods because of the company in which they were created. If the method is good, it can be used for good works.

The whole range of the world's peoples should receive and understand as much as possible about intellectual knowledge, its origins, its present state, its directions and its effects upon the world. The facts and the attitudes of the scientific method basic to all intellectual endeavor are a part of the culture pattern under which an individual develops.

This means, ideally, that the intellectual background and its application to the world about us be absorbed as a result of what is learned in the home and in the schools. The more practical and basic aspects should be acquired almost automatically as a part of the educational equipment of every individual. Obviously this is not the case for millions of people. Even where civilization is most advanced, there are many in the population who have no acquaintanceship with either facts or the methods that are used in the development and utilization of organized knowledge.

There is need for a continuation of learning due to the rapid advancement of knowledge in the present years.

To keep up-to-date in the many fields of human endeavor, such as science, politics, economics and trade, one must constantly climb in order to remain upon the level of common knowledge.

There are many channels through which the current information can reach the people. Most important in most of the nations in the world is the press, particularly newspapers issued daily in the more thickly settled regions. The daily press has an obligation to report and interpret the advances of physical, economics and social sciences as effectively and as accurately as it does the more traditional facets of news, relating to politics, crime, sports, the arts and other human affairs. Within the last two decades, publishers and editors have fulfilled to a larger degree than in previous years this obligation to report and explain important knowledge to their readers.

For this vast audience of newspaper readers, a simplicity and clarity of presentation is necessary. Knowledge of background, no matter how well-rounded and intelligent the audience is assumed to be, cannot be taken for granted. Very much like the growth of the animal fetus, each news report in essence must almost recapitulate the whole evolution of human knowledge pertinent to the new facts being presented. Suppose an article is about the effect of atomic radiation upon human heredity. First, to understand the implications, one must know something about the complex facts of genetics, a science which is barely a half century old even in its most elementary origins. Second, there must be knowledge of atomic energy, a whole new conception of matter which has been available to the understanding of

most of us for little more than a decade. Somehow or other, skillful interpreters, largely through words, must paint mental pictures of just what happens in the passage of the basic germ plasm of humanity from generation to generation. Then there must be told just what happens when the small atomic bits of matter split and let loose energetic radiation. Then there is the effect of this radiation upon the future form and mentality of generations yet unborn.

Artist As Well As Scientist

This is a great challenge. The skillful writer must be as much of an artist as a scientist. He may be a journalist with a great gift of expression, a master in the use of words, and yet if he does not have this fundamental information, acquired preferably by some baptism in the scientific laboratory, he cannot be a successful interpreter of science. He must know what he is writing about.

The writing for the general public, largely through the press, must be simple, concise and vivid. The extremely technical words, until and unless they have become a part of the general vocabulary of most of the people, must be put into popular synonyms or explained so they will be understood. This does present difficulties because the expert, with his shorthand of technical jargon, adopted for reasons of simplicity and exactness, is often quite right in feeling that only the one precise word will be adequate.

Successful popularization or interpretation, therefore, must undertake to explain what has been discovered or what the consequences of application will be, even to those who do not know the language. In a sense such interpretation is more difficult and more complex than interpretation from one language into another. The Frenchman and the Englishman have very often the same general concepts. The only difficulty is the words, and even many of them have the same roots. When it comes to telling a person about some technical concept or achievement of which he has had no prior acquaintance, it is a matter not only of talking a different language, but of translating into what is often a different mode of speaking and a different set of coordinates.

Through this translation of the knowledge of the expert into the everyday of action, we can translate the past into the future.

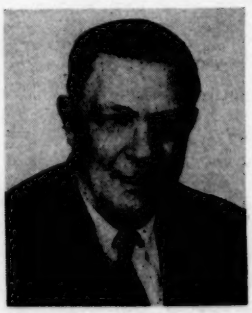
It is no simple task we have. It is as competitive and complex as it is important. It is never static. It is as changing and challenging as the content that the writing conveys. ■

Training Tomorrow's Scientists for Resource Development

HOWARD A. MEYERHOFF

Manpower requirements in the resource field are rapidly becoming more exacting. New advances in agriculture, forestry, and fisheries will depend upon specialists with graduate training and upon team research that will bring expert knowledge from several scientific fields to bear on resource problems. Even in the mineral resource field, new discoveries will be made chiefly through instrumentation.

In a paper presented at the Thirteenth Annual Meeting of the Soil Conservation Society of America, a geologist and manpower specialist demonstrated the growing need for graduate training in the resource fields and in leadership if the requirements of an expanding population are to be successfully met.



Howard A. Meyerhoff is Executive Director of the Scientific Manpower Commission, which is sponsored by the national scientific organizations, including the Policy Committee for Scientific Agricultural Societies and the American Institute of Biological Sciences. A geologist by training, he is still active as a consultant in mineral resource development.

IN TRAINING tomorrow's scientists we must keep in mind tomorrow's needs. To forecast the requirements of the human race in a period that has witnessed both population and technological explosions is no small task. We are training tomorrow's scientists today, for in the fields of resource development it takes a minimum of four years to produce a technician, and at least seven years to produce a full-blown scientist with the qualities of leadership that are so imperative in the solution of tomorrow's problems.

First, let us define tomorrow's needs in terms of population, which is at once our major problem and our major

manpower resource. The earth's inhabitants pose a problem because they must be fed, clothed, and supported—not just in the style to which they have been accustomed, but in the style to which they would like to become accustomed. When we consider that the world's population is doubling every generation, we can foresee the imperative need of a technology that will continue to expand as explosively as our exploding population.

In much of the past it has been the custom to "let nature have its way." For several decades, however, the scientist has been trying, with varying success, to have his way with nature. In the future he must be increasingly successful if we are to keep one or more jumps ahead of the dire predictions of Malthus. Simply stated, the problem is the recovery of finite resources from a finite earth that is being called upon to support a population growing at a geometric rate. Birth control would supply only a partial solution to the broad problems of resource development. It might serve to bring the renewable resources into a steady-state balance with a static population, but would not replenish the dwindling supplies of the nonrenewable resources. Nor would it necessarily accommodate itself to the new demands and requirements of an evolving technology. Birth control, however, is a subject that lies beyond the scope of this paper and beyond the competence of its author.

Current Manpower Supply

From this burgeoning world population we must recruit specialists whose function it is to apply scientific principles and method to the production of more and better food for the populace and to discover and recover the nonrenewable resources—energy, metals, and industrial minerals. In the United States we are turning out approximately 9 to 10 thousand agriculturalists a year—7,000 with Bachelor's degrees, slightly fewer than 2,000 with Master's degrees, and roughly 600 to 700 with Doctor's degrees. Their ranks are swollen by an indeterminate number of organic chemists and general biologists, whose specialties lead them into problems of food production, pest control, and nonfood uses for plant and animal products. In all, a scant 12,000 specialists, some of them not too highly trained, are annually being added to the corps of scientists and technologists charged with the responsibility of supplying the nation with food and with some of its shelter, clothing, and luxuries.

For the nonrenewable resources, our institutions of higher learning are turning out nearly 3,000 geologists and geophysicists a year, though by no means all of them are concerned with the discovery and development of mineral resources. Of this number, some 500 earn Master's degrees, and 150 Doctor's degrees. Add to these figures the mining, metallurgical, and civil engineers concerned with the development and utilization of mineral raw materials, and the annual increment becomes approximately 4,000.

It is pointless to speculate whether these numbers are adequate for our current needs, for our judgment is likely to be distorted either by the vicissitudes of the present or by the urgent requirements of the future. At this moment in time we have surpluses of nearly everything—grain, coal, oil, iron, aluminum, lead, and zinc. Offhand, it looks as if too many agriculturalists have enabled the American farmer to obtain too high a crop yield, with too little competition from pests; that geologists and geophysicists have found too much coal, oil, iron, lead, and zinc. When, however, the rising rate of consumption is measured against the current rate of production, it is evident that the gaps that now exist between production and consumption will soon be closed, and that it will take all the running our scientists can do to stay in the same place with respect to a growing population with growing demands.

Team Research in Agriculture

The problems that must be solved in the future are not merely quantitative, even though our objective may be to turn out more produce and more products for more people. As every agronomist knows, larger yields can be obtained through several entirely different avenues of scientific approach. By crossbreeding the geneticist has improved the strain of virtually every food crop and has developed varieties that are adapted to different soils, varying lengths of growing season, special planting procedures, and wide ranges of precipitation and temperature. The mycologist and the entomologist have cut substantial losses by means of pest control, and in this work they have again been aided by the geneticist, who has found it possible to produce disease-resistant varieties. The soil scientist is reaching the point where he can prescribe either the soil type in which specific varieties of food plants can grow, or the addition of chemical and organic materials necessary in the soils to obtain optimum yields. With the cooperation of the chemist, he has developed mineral fertilizers and, with the assistance of the plant physiologist, he will soon learn the role of the trace elements in promoting or hampering the growth of crops and the fodder upon which food animals must subsist.

Comparable progress has been made in the field of animal husbandry and here, too, one fact stands out significantly. No one type of specialty has ever provided the entire solution to the problem of more efficient food production. Solutions have come from genetics, physiology, biochemistry, mycology, entomology, chemistry, and geology. The specialist, to be sure, has made tremendous advances and impressive contributions. He will continue

to do so. But in the agriculture of tomorrow specialization will yield diminishing returns. Figuratively speaking, new scientific fields must be plowed by teams of specialists, directed by generalists capable of appreciating, or even divining, the interplay of two or more branches of science.

Happily, team research is already well developed in agriculture, thanks to the experiment station and its team approach to specific problems. The experiment station approach, however, must be further refined, and the agricultural scientist of the future must be more than a specialist in a single field. The need for Ph.D.s in agriculture will become increasingly urgent, and it behooves everyone in the field to stress the opportunity awaiting the intensively yet broadly trained scientist in keeping crop and animal production abreast of the rising tide of population.

Call of the Sea

New fields must be invaded, too. The sea is attracting attention as a source of food, but little has been done to cultivate its possibilities. Japan has done more than other countries to utilize the marine potential, but elsewhere nature has been allowed to take her course too freely in the reproduction of fish. What can be done is perhaps best illustrated by oyster culture, but even this lucrative field has just begun to make use of the basic principles of marine biology and oceanography. No scientific gains are made by the arbitrary shifting of national boundaries from 3 to 12, or even 20 or 200 miles, offshore, for the basic problems are those of marine ecology, genetics, and physiology. At present we are mining the sea of its edible life much as we mined our soils and forests in the earlier stages of our history.

Cropping the Trees

Belatedly, we have come to recognize our forests as a renewable resource. Now the larger and more foresighted commercial lumber companies entertain the hope that the corporate life of their companies will be longer than the lives of the individual trees that provide them with their raw materials. Conservation has become as important to them as it has been for many years to the federal and state governments in the conservation of forests on public lands. The forester is no longer restricted to public service in his choice of jobs; he may now enter the commercial field and will continue to do so in mounting numbers in the forestry of tomorrow.

It is futile to hope that the flood of paper that engulfs us all will subside, and to meet the growing demand for paper and paper products—not to mention the many other equally important products of the forest—more foresters will be needed than the 1,200 to 1,300 who are now coming annually from our schools. Indeed, new kinds of foresters must be developed to carry out the research that is waiting to be done. At present only 3.5 per cent of the men and women who enter this field continue their studies into the graduate school and earn a Doctor's degree. The percentage must rise substantially above this low figure and also above the 20 per cent who seek the Master's degree. Numerically, perhaps, the demand will not be much greater than it is at present, except at the higher degree levels, but it will be steady.

Research in this field, in part, requires a different approach than research in agriculture, if only because of the longevity of trees. The individual researcher must expect many of the projects he starts to remain unfinished when he retires; hence the work must be so planned that it can be carried on by his successors. It would be presumptuous of me to outline some of the research projects that need doing, for I am not a specialist in the field. But I have followed developments in forestry with an amateur's interest and have acquired an appreciation of the research possibilities, which I find both exciting and challenging.

Finding Hidden Wealth

In geology and mineral resources, the commercial minerals and fuels present a different situation than do our agricultural, forest, and marine resources, because they are nonrenewable. Once used, they are gone forever and new sources of supply must be sought and found. To the extent that our national security demands, research should be focused upon the lands within our national boundaries.

Thanks to two world wars and to an explosively expanding economy, the United States has produced and consumed more of its mineral heritage in the past thirty years than in all its preceding history. Throughout the entire nineteenth century, and even in the early part of the twentieth, the only manpower required for the discovery of new mineral deposits was the prospector—a unique species of human being who found satisfaction bucking the hardships and vicissitudes of the wide-open spaces merely to find—and rarely to exploit—unknown mineral wealth. The day of the prospector is gone. There are few, if any, visible mineral deposits left to discover within the confines of our country, by the easy method of sight inspection. New discoveries will depend on new techniques.

Instrumentation has already become, and will increasingly become, an indispensable tool for the exploration geologist and geophysicist. The science of geophysics has already made notable progress in the discovery and development of petroleum and natural gas, but it is in its infancy in exploration for new metallic deposits. And

scarcely any use has been made of geophysics in finding nonmetallic minerals. The possibilities of geochemistry are only now being appreciated, and the geologist is slowly—and somewhat reluctantly—reaching the point of admitting that the basic principles of his science need a great deal of refinement if they are to be applied successfully to the discovery of new deposits of commercial minerals.

Recently, an Advisory Committee on Minerals Research, appointed by the National Science Foundation, analyzed the needs for new basic information in geology, geophysics, and geochemistry if the United States is to expand the domestic base of mineral raw materials. The committee pointed out that 90 per cent of our metallic wealth has come from a scant thousand square miles of our domain. There must be even larger mineralized areas hidden from view and awaiting discovery as new principles and new techniques are evolved and applied where sight inspection, or such simple devices as the dip needle and Geiger counter, are useless.

For the further development of our domestic mineral resources, the manpower requirements of tomorrow are clear. They differ somewhat from those in agriculture, because it is evident that such fields of specialization as geophysics and geochemistry demand much more intensive cultivation, and this can be accomplished only by the specialist. Although much remains to be done through specialization, the same limitations as apply in agriculture apply also in the earth sciences. There must be an interplay—a crossbreeding— among the specialties. One reason why there has not been greater progress in exploration geophysics in the discovery of metallic and nonmetallic mineral deposits lies in the inability of economic geologists and geophysicists to get together and to speak a common language, such as has evolved in the field of petroleum geology.

As in the agricultural sciences, tomorrow's earth scientists must have a higher level of training. Of the 3,000 graduates turned out annually, 75 per cent are Bachelors, 20 per cent Masters, and 5 per cent Doctors. The Bachelor is little more than a good technician, of limited utility. He has been in demand, however, largely because of the scope and magnitude of foreign exploration, where well-trained supporting personnel is an important factor. In the mid 1950's, when the oil and mining industry were acutely affected by the economic recession, the supply of men with Bachelor's degrees in the earth sciences exceeded the demand. However, men with Master's degrees have had little trouble securing good positions, and the opening for Doctors of Philosophy in geology outstripped the supply by a wide margin. Temporary though the recession in 1958 may have been, the distribution of demand is a harbinger of the pattern of the future. Undergraduate training will not be enough. Just as the day of the prospector has faded into history, so, too, is the epoch of the reconnaissance geologist coming to an end—unless, in this so-called space age, he can undertake preliminary exploration on the moon and on Mars and the other planets.

Qualitative and Quantitative Needs

This paper does not cover the entire resource field, but the pattern that has been developed for agricultural and mineral resources extends with only minor variations into other resource fields. The plant, animal, soil, and earth sciences have passed through those descriptive phases of development in which almost anyone with eyes and a brain could make a contribution. They have moved so far into the stage of experimentation that the narrowly trained specialist will find his utility circumscribed until and unless his work is stimulated either by new and profound basic discoveries or by cross-fertilization with other specialties.

The future of the resource sciences depends almost entirely upon basic research that will pick up where our present knowledge ends, and upon the integration of specialties that took off and diverged from a common base but now must converge again if we are to make progress. Though complex, the manpower needs are clear. There is still an imperative need for the highly trained specialists, although his training should be broad enough to embrace a knowledge of peripheral subjects. There is a more urgent requirement for what has been called the generalist, who should be an accomplished scientist, but one who is literate in two or more fields and who has the rare ability to synthesize. And still more vital for the resource development of tomorrow is the need for effectively integrated teamwork.

Qualitatively, the professional standards for tomorrow's resource scientists are high and can be met only if more of our young people are persuaded to continue their studies beyond the college into the graduate school. The quantitative requirements are equally exacting, for even with the time-saving devices of computers, there is no automation in scientific research. It takes the brains of individual researchers, with highly competent supporting personnel, to do the jobs that must be done to supply our growing population, in an expanding economy, with food, shelter, and material goods. We may take the few figures I have given covering the production of agricultural and earth scientists, compound them at 5 per cent per annum, and come out with an approximation of our quantitative needs for the future. Obviously, we have work to do in recruiting and training tomorrow's scientists even to hold our own, much less to make the progress that the American people expect and demand. ■

Soil and Water Conservation by Regulation

J. W. DE ZEEUW AND P. J. ZWERMAN

WHAT is the secret of Dutch success in making land productive? How is it possible for the most densely populated country in the world to produce some of the highest yields per acre on soils that were naturally very unproductive (1), (3)?

Through the long history of Dutch agriculture, basic problems of limited land and careful manipulation of water have forced the nation to adopt regulatory measures for economic survival. Land and water-use regulation are combined with a strong, progressive agricultural policy of research and education. Through this combination, the Dutch have effectively demonstrated to the world good results from soil and water conservation practices.

The Dutch have learned through the centuries what people in the United States are just beginning to realize: that land is a precious commodity that must be safeguarded by every individual who farms it either through personal interest or regulatory measures.

With a limited land of 12,500 square miles and a rapidly growing population of over 11,000,000 the Dutch government has followed a land-expansion policy by reclaiming the former Zuider Zee. These great engineering feats of wetland reclamation are well known. What is not well known is that the Dutch people have learned through bitter experience that a chain is no stronger than its weakest link. Their struggle against the sea has taught them to impose strict government regulations for the proper maintenance of dikes and use of land.

The western or larger portion of the Netherlands' soils is made up of peat and strips of clay along branches of the Rhine, Meuse and Schelde Rivers. These organic soils or peat were protected from the sea by sand dunes. Where the dunes had been broken through, chiefly in the North, large areas of clay occurred. This entire area with the exception of the dunes was originally at an elevation of only one or two meters above mean sea level.

The smaller or eastern portion of the country originated from sand land between five to forty meters above sea level (3). Here the rivers and creeks built deposits of clay and peat.

The history of self-imposed conservation measures by individuals, groups of farmers, and government regulations shows that when the need is great enough a society will take drastic measures to enforce conservation.

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This paper is a joint contribution from the Department of Land Drainage and Land Improvement, State Agricultural University, Wageningen, The Netherlands and the Department of Agronomy, Cornell University, Ithaca, New York, U. S. A. Agronomy paper number 451.

In its very broadest sense soil and water conservation may be said to be the relationship of society with its natural environment.

In the Netherlands, two terms are constantly used: one, is "polder," and the other is "waterschap." "Polder" applies largely to any area of land that is diked, drained, and pumped. "Waterschap" indicates a local organization which operates the "polder" or other similar area of land where improvements are necessary. The polder board is elected by and from among the land owners.

Early Land Settlement

The Netherlands were originally covered by forests except perhaps for some regions in the organic soils districts (2). The original people were migratory hunters and fishermen. Next came tribes of farmers (about 2000 B. C.) who cut down the trees and penetrated the thin forests on the higher, less fertile soils. They settled mainly along small streams in the sandy area (Figure 1).

Their original system of simple land utilization developed into one which was to use the highest-lying sandy soils for sheep pasture (9). The shepherds had to bring their flocks to the village or settlement every evening. Thus there was a constant return of manure and

Figure 1. Burial vaults indicate the comparatively dense farming population 4,000 years ago in certain regions of Northern Europe. In the center of the province of Drente in an area of approximately 200,000 acres there are known to have been one hundred of these community burial vaults.

bedding to the village area. The lower lands were used for arable crops. Cattle were grazed along the streams. The result of this system was that the sheep-grazing land grew poorer and poorer and developed into large regions of heather. The necessary ratio of heather to arable land was ten to one. There is evidence in some places that wind erosion occurred in these heather fields. The lower, cultivated areas became improved soils which were built on the arable land by continuous manuring. These soils have black top layers of 0.7 to 1 meter in thickness (Figure 2).

From about 2,000 years ago until the beginning of the 19th century rural communities were governed by several kinds of nobility who were overlords more or less foreign to their subjects.

Figure 2. Soil types tell the history of land use and of the soil management system. The double podsol profile on the left developed on heather. The upper podsol must have developed on wind deposited materials. These materials may have been blown from burned or overgrazed heather. The "es" profile on the right has a black "topsoil" of one meter depth. This "topsoil" was developed on arable land as a result of continuous application of stable manure for a thousand years. (Soil Profiles supplied by the Laboratory of Geology, Agricultural University, Wageningen.)

The economic situation was such that the noblemen were dependent upon taxes. Therefore they were very much interested in making and keeping the soils of their subjects productive. The peasants or farmers had the same interest because there was very little new land available to them. This complex of social circumstances together with the Biblical conception that a man was responsible for the soil are probably two of the reasons why European farmers regard their land and soil so highly.

Over the years, implements were improved, organization of society grew stronger, and population increased. It now became possible to undertake more difficult reclamations. About 1,000 years ago the farmers living on the higher land were able to penetrate the denser virgin forests and utilize the wetter soils in the peat regions. The construction of dikes and the drainage of wetter soils was begun in the western portion of the Netherlands. This has continued until the present time (6). It has only been in the last century when artificial fertilizers became available that the reclamation of the higher part of the country was completed by bringing the large heather fields under the plow (4).

Regulation of Land and Water Use Starts

- *Controlled Exploitation of the Peat:*

About the Year 1,000 the Dukes of Holland and the Bishops of Utrecht started to give out concessions for the development of a large organic soil area west of Utrecht (7). The organic soil was drained by means of ditches placed 120 meters apart. From the tax records it appears that after drainage the land was mostly used as arable land for rye and oats production (5), (7). The remainder of the land or waste organic soils was used for pasture. Thus a system of sheep grazing and arable land farming developed on the areas of organic soils. This system was very similar to that of the sandy land.

In the year 1297, when farms were leased near Utrecht, the regulation was made that each farmer should have on his farm one-third grassland and two-thirds arable land (5). The intent here must have been to protect against wind erosion those organic soils which had not yet been dug for peat. At present the same decree is issued by the government when leasing farms on light sandy soils in the Zuiderzee polders.[1]

[1] People who lived in the peat area found it necessary to use peat for heating since there was not sufficient wood available. Apparently the organic soil or turf was removed to the ground water level so that the soil was no longer suitable for arable land. From the year 1399 a regulation was handed down stating that farmers must save the top soil and restore it to the land after turf removal (5). Similar decrees are still in force in the Northeast provinces where large areas of high moor peat have been dug during the past three centuries. As a result of this regulation this Northeastern area is now a region of arable land with a high production of cereals and potatoes.

The decree of 1399 stated further that the dug off peat land should immediately be planted with alders (*Alnus spp.*) "according to the good practice of the country" to prevent further degeneration of the soil (5).

By about 1600 the exploitation of the higher lying peat in the western region of the Netherlands was complete. In some places the peat was even dredged out below the water table. After 1600 dredging below the water table continued; as a consequence of this practice large artificial lakes were formed.

● *Reclaiming the Exploited Land:*

By pumping down the water table at first by means of windmills the reclamation of these large artificial lakes became possible. They were used for grassland where they still contained organic soils, but where the lake bottoms were loamy they were used for arable land. As a consequence of these operations "polders" came into existence, and with the "polder" the "waterschap," its governing body, was formed.

How were funds obtained for all this construction? Decrees were made that a certain sum of money should be paid for each volume of peat that had been dredged. The intention was to provide funds for reclamation of areas that had been so exploited. This old regulation is still in force with respect to the digging of clay for brick making. Also the same regulation applies to the removal of sand or gravel.

After a polder had been formed, strict regulations were applied within each polder. The owner of the land pays taxes to the polder board or waterschap for the maintenance of dikes, canals and other technical work, as well as for the cost of pumping water. If the owner does not want to pay or is not able to do so his properties can be sold at public auction to collect the necessary taxes. The land owner is also obligated to clean the ditches on and adjoining his own farm. Twice a year the polder board inspects the ditches. If they are not cleaned, the board cleans them and charges the land owner. These polders developed over time in flat-land areas where all land owners had similar and common needs for controlling water. However, in modern times a system of drainage districts or waterschappen has been extended over the entire area of the Netherlands including the higher sandy soils region. Improvement of whole watersheds or drainage areas was an objective with the farmers on the higher lands sharing in the costs of improving and maintaining stream channels and drainage.

● *A Multiple-Use Project:*

Multiple-purpose regulations were enforced at an early date. An outstanding project example, placed into effect shortly after the city of Wageningen was founded in 1263, still exists (Figure 3). The project covers about 1,000 hectares (2,500 acres) directly to the north of the city of Wageningen (10). The history of this water conservation and land improvement project, carried out around 1300, may well give modern conservationists food for thought.

In this region there were intermittent streams that led the water to the flat bottom of the valley where it followed a winding course and discharged into the River Rhine. It would have been simple to drain this land by regulating and enlarging the streams running down the slope. However, there are two dangers to consider—dryness in the summer on the slopes and increased flooding of the bottom lands in the rainy periods.

To control the water and to get the most effective use of the land, 2,500 acres were divided into two drainage areas (Figure 3). They were separated by a dike constructed on the 8-meter contour. The entire area was then "terraced" at intervals of 570 meters. In actual practice these "terraces" were roads parallel to the 8-meter contour. These roads had a drainage ditch on the uphill side. There were field drains or field ditches up and down the slope at right angles to the roads or "terraces." Surplus water was drained to the road ditch. During the winter each "terrace" drained into the next lower one by means of temporary trenches which were dug through the roads (terraces).

This same system was applied to both the upper and lower portion of the original area. However, a main drainage canal was dug along the upper side of the 8-meter contour dike. This canal served as an outlet for the upper drainage area and the original meandering stream served as an outlet for the lower portion. The main canal collected the surplus water from the higher-lying "terraces" and brought it to the River Rhine through the defense moats of the city of Wageningen.

This system possessed a feature that clearly illustrates that the designer was aware of the importance of maintaining the water level in the soil during the summer. It was impossible to always maintain the water level in the main or diked canal as high as it should be for the adjacent lands during the summer. For this reason these lands were separated from the main canal by an embankment with a ditch along the upper side (Figure 4). This embankment served the same function as the roads or terraces. During dry periods or in the summer, it served to hold the water in the soil by slowing down surface runoff and drainage. In winter or during wet periods the embankment would be trenched to provide outlets for the surplus water to the diked canal.

Thus the orders of the Duke of Gelderland, who founded the city of Wageningen as a fortress for defending his borders, were effective in creating a multiple project for soil and water conservation and land use as well as providing water for the defensive moats of the city.

Within the past ten years the senior author has seen

(Photo by K.L.M., Royal Dutch Airlines, Aerocarto.)

Figure 3. Aerial view of good conservation practices 650 years old, to the north of the City of Wageningen. The general slope of the region to the north of Wageningen is from east-northeast to westsouthwest. Note the parallel roads or "terraces" 570 meters apart. The fourth "terrace" from the left is the main canal which intercepted all of the water from up slope and brought it into the Rhine through the city moat. The moat appears as a roughly heartshape black band. The old city within it is on the southwestern side of the present center of buildings. Note the river Rhine in the extreme upper left corner of the photograph. The canal on the right side of the photograph was dug in 1473 to replace the winding stream (still visible in fields to left of canal) which formerly took the surplus water from the lower "terraces".

Figure 4. The multiple-use water system to the north of Wageningen. From right to left: (1) The road situated on the dike which forms the main water control of the system; (2) the main canal running in the direction of Wageningen; (3) the embankment to prevent water loss for adjoining fields during dry summers; (4) along the fence the normal water disposal ditch. The embankment was dug through during the winter.

farmers digging through this embankment to let their surplus water into the diked canal. This system was so well designed for water conservation and management that no major alterations had to be made when this area came into a modern development scheme some 15 years ago.

• *Grazing Control:*

The early users of the land also exercised control over grazing. A report on such control was delivered by Sybert van Hezevelt in the year 1560 to his master the Duke of Gelderland (8). Van Hezevelt was one of the fire masters of the Veluwe which is a high sandy region in the center of the Netherlands, covered at the time, with regions of heather. The agricultural system was the same as was described earlier: grazing on the high heather fields, with arable land in the lower parts of the landscape. Most of this area has since been reforested.

Van Hezevelt complained that the subjects of the Duke of Gelderland would secretly burn the heather so that they might be able to graze their sheep and other animals on the fresh young shoots that came out. Burning and subsequent overgrazing laid the soil open to wind erosion. Van Hezevelt pointed out that this wind erosion was damaging to the surrounding villages and arable land. Fire masters and overseers were necessary to prevent this wind erosion. There were also formal written laws on grazing regulation, which were enforced by decree and supervision (8).

Present Land and Water Use Regulations

A study of early regulations controlling the use of land and water, leads us to a better understanding of the basis for present-day intensive and well-organized agricultural policy.

The Dutch government has over the past 70 years, spent much money for education in agriculture. The Dutch farmer is perhaps the most educated farmer in the world. Regulations are established where a common interest exists which can only be realized by joint effort. Moreover, regulations are established to prevent loss of or damage to land and water resources.

Regulations in agriculture extend beyond the immediate problems related to soil and water conservation. Agricultural policy is carried out through a pyramid form of organization called the Foundation for Agriculture. This super-organization is semi-official and has the power to regulate working hours, wages, and other matters related to agriculture (1). The present-day trend and attitude toward regulation can better be understood when there is realization that this organization is currently discussing the feasibility of licensing farmers. An individual who wishes to become a farmer might have to pass certain examinations and meet certain standards. Thus the society would be assured of a maximum safe return from a limited land and water resource.

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Some Effects of Land Use and Treatment on Small Single Crop Watersheds

J. L. McGUINNESS, L. L. HARROLD AND F. R. DREIBELBIS

WHAT is the effect of land-use practices on peak rates of runoff, total runoff, soil erosion, and farm economy? Analysis of the 1945-56 data from eight small, single-crop watersheds on the Coshocton, Ohio, Research Station provides tentative answers to these questions under the conditions of that locality. Differences due to the specific land-use program were found to be significant

J. L. McGuinness is Analytical Statistician, L. L. Harrold is Project Supervisor, and F. R. Dreibelbis is Soil Scientist, Coshocton, Ohio.

Contribution from the Watershed Technology Research Branch, Agricultural Research Service, USDA, Coshocton, Ohio, in cooperation with the Ohio Agricultural Experiment Station. Grateful acknowledgement is made of the assistance of Dan E. Hall, Mildred A. Pigman, Mary K. Royer, and Robert E. Youker in the collection and tabulation of the basic watershed data.

Summary

Studies on eight small watersheds at Coshocton, Ohio, showed that improved farming practices resulted on the average in smaller rates of runoff, more water absorption, less soil erosion, and greater profits. The average differences between the treatments are statistically significant. There yet remains the problem of projecting the water results downstream to larger mixed-cover watersheds.

Introduction

Erosion control practices such as contour tillage, strip cropping, and the like were first tested on small plots. Their effectiveness was so apparent that they were widely recommended as a major item in the soil and water conservation program for our farmland.

It was early recognized, however, that water behavior on a small plot with artificial sides creating dams in the contour rows was not like that in a natural field. Furthermore, exact contouring contrasted with the extreme up-and-down-hill rows was not comparable to average farm field conditions.

In order to develop quantitative benefit values for an improved program under field conditions, eight small natural watersheds were selected for a comparative study near Coshocton, Ohio, in 1941 (Table 1). The purpose was to compare the effects of improved farm practices with prevailing farm practices on characteristics of runoff and erosion.

The watersheds were matched into four pairs, each pair being as nearly alike as possible in area, slope, exposure, and other features. A four-year rotation of corn, wheat and two years of meadow was followed on all watersheds. The treatments were established in 1944 and from then on each treatment and each crop was represented each year—with the paired watersheds being in the same crop but different treatments. Except for treatment, all other variables such as dates of planting and cultivation, and seed varieties, were kept the same.

The prevailing-practice treatment was intended to represent the method of farming used by the average farmer in the Coshocton area. Soil pH was low, about 5.4, since little lime was used. Six tons of manure per acre were plowed down for corn. Corn rows were planted straight across the irregular slopes—not up-and-down-hill. One hundred pounds of 2-12-6 fertilizer per acre were applied in the row for corn and 125 pounds per acre drilled at wheat planting. The meadow was an unfertilized timothy-clover mixture.

The improved practice was what might be expected on an average cooperating farm of the Soil Conservation District. It was not necessarily the very best system possible for these particular watersheds. Soil pH of about 6.8 was maintained by liming. Six tons of manure were plowed down and 300 pounds of 3-12-12 fertilizer

TABLE 1

Physical Characteristics of Eight Small Watersheds Near Coshocton, Ohio

Watershed Number	115	109	110	103	118	113	106	121
Soil type	Muskingum silt loam		Keene silt loam		Coshocton silt loam		Muskingum loam	
Treatment	Prevailing	Improved	Prevailing	Improved	Prevailing	Improved	Prevailing	Improved
Area, acres	1.61	1.69	1.27	0.65	1.96	1.45	1.56	1.42
Average slope, %	6.6	12.7	13.0	11.3	9.6	9.3	14.3	15.3
Average slope in corn rows, %	3.6	0-1	6.3	0-1	3.4	0-1	5.9	0-1
Erosion class	2-100%	2- 90% 3- 10%	2-100%	2-100%	2-100%	2- 50% 3- 50%	3- 60% 4- 40%	3-100%
Land Capability	II- 32% III- 68%	III-100%	III-100%	III-100%	III-100%	III-100%	III- 60% IV- 40%	III- 89% IV- 11%
Crop in 1945	Corn	Corn	Meadow 2	Meadow 2	Meadow 1	Meadow 1	Wheat	Wheat

per acre were applied for corn. Corn was planted in contour rows. Another 300 pounds of fertilizer plus 4 tons of manure topdressing were applied on wheat. The alfalfa-timothy-clover meadow received 200 pounds of 0-20-20 per acre in its first year.

Figure 1 shows the runoff measuring equipment used on the watersheds. The watersheds were all equipped with H-type flumes, FW-1 type water-level recorders, and Coshocton silt-sampling wheels. Watershed size averaged about 1½ acres. A general view of one of the watersheds is given in Figure 2.

Rates and Amounts of Runoff

During the period of record, high rates of rainfall were confined normally to the growing season (Table 2). For example, there was very little rain that fell at rates greater than 2 inches per hour ouside the May-September period. Larger amounts of rain fell at higher rates in June and July. This resulted in high-peak rates of runoff and erosion in these two months.

The highest rates of runoff from these watersheds occurred in the May-October season—both under prevailing and improved practices (Table 3). In the corn years the average reduction in peak rates as a result of the improved farming program was 0.82 inch per hour, for wheat 0.22, and for meadow 0.04.

For extremely infrequent intense storms, the effect of improved practices for corn on peak rates tended to disappear. In fact, in the June 12, 1957 storm (once in over 200 years of occurrence) the peak runoff rate from corn under improved practices was 5.97 inches per hour

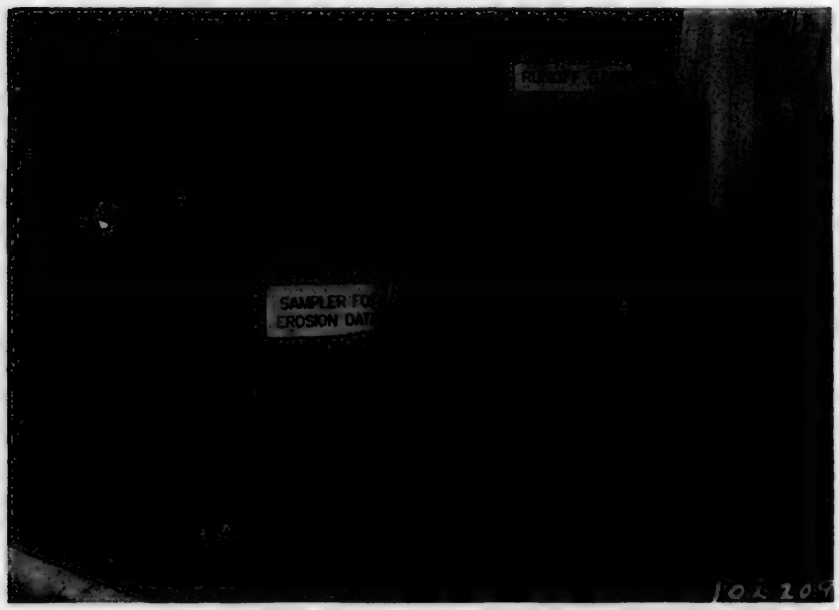

Figure 1. The runoff and erosion measuring equipment used on the eight watersheds, Coshocton: H-type flume, FW-1 type water-level recorder, and Coshocton silt-sampling wheel.

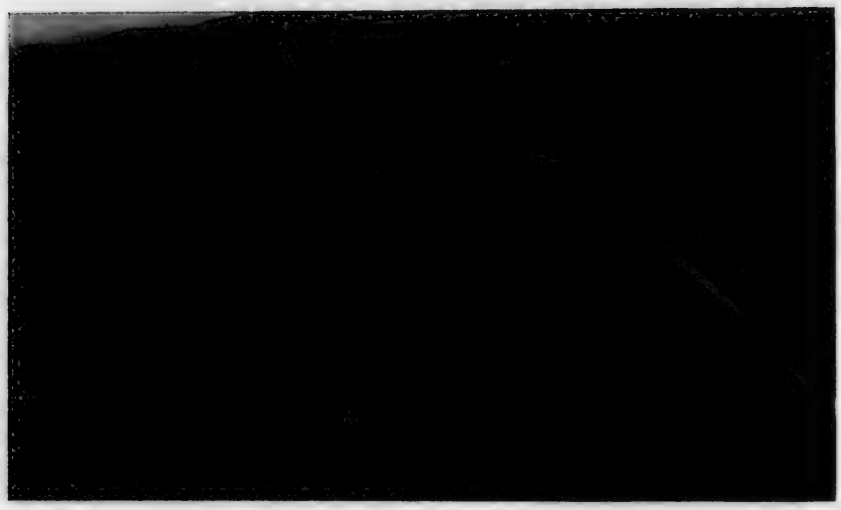

Figure 2. General view of one of the experimental watersheds. The superimposed dotted lines outline a watershed of about one and a half acres, Coshocton.

TABLE 2
Twelve-year Average of Monthly Rainfall Intensities, Coshocton, Ohio, 1945-1956

Intensity Inches/Hour	Average amount of rain falling at rates equal to or greater than that shown in first column, inches												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Total
0*	3.36	2.58	3.53	3.47	4.04	3.87	4.50	2.31	3.12	2.09	2.56	2.08	37.51
.3	.22	.17	.48	.53	1.15	1.79	2.44	1.08	1.24	.29	.22	.11	9.72
.5	.12	.10	.31	.38	.86	1.49	2.04	.91	.98	.18	.14	.06	7.57
1.0	.04	.06	.16	.20	.51	.86	1.26	.58	.57	.08	.07	.03	4.42
2.0	.01	.03	.05	.07	.22	.44	.51	.24	.21	.02	.01	T	1.81
4.0	T	.01	.01	.01	.04	.08	.08	.03	.02	T	0	0	.28

* The O line represents total average rainfall.
T=trace.

TABLE 3
Average Peak Rates and Amounts of Runoff by Crops in 4-year Rotation, Coshocton, Ohio, 1945-1956

Crop	Time on Land	Peak Rates		Total Runoff Amounts		Average Monthly Runoff Amounts	
		Prevailing	Improved	Prevailing	Improved	Prevailing	Improved
		In./Hr.	In./Hr.	Inches	Inches	Inches	Inches
Corn	May 1 to October 10	1.76	0.94	2.31	1.09	0.43	0.20
Wheat	October 11 to July 17	.40	.18	1.95	1.29	.21	.14
Meadow	33 months	.28	.24	3.51	2.41	.10	.07
Total for 4-year rotation				7.77	4.79		

and that from prevailing, 4.12 inches per hour. Sudden release of water from breakage of contour ridges was the cause of the higher peak flow from the improved-practice area.

In the four-year rotation, the average reductions in runoff amount due to the improved practice was about 3 inches, or about 0.75 inch per year. Over an inch of this occurred in the corn season. Most of the water retained by the improved practices during this season resulted from contouring. The corn cover in both practices was rather open, much soil was exposed to the beating action of the raindrops, and infiltration rates were low. Contouring, however, provided more surface storage for excess water. It also insured that an average unit of excess water had a longer route to travel before running off at the gage site. Thus, chances for infiltration were increased and rates and amounts of runoff were materially reduced, except as noted above.

In contrast to the exposed soil in the row crop, both wheat and meadow furnished a fairly complete ground cover. Because of this protection from raindrop impact, infiltration rates were greater and peak rates of runoff less than those of corn—under both practices. The dense growing plants of wheat and meadow consumed large quantities of water early in the season and, thus, provided more soil storage space for water. They were also a greater impediment to overland flow than corn plants and, thus, increased the infiltration opportunity.

The average peak flow rates from wheat under improved practices were significantly less than from wheat under prevailing practices, but from meadow the rates were about the same under both treatments. Both the heavier residues from the preceding corn crop plus the manure topdressing helped to provide a rougher and more permeable surface on the improved practice wheat watersheds.

The average runoff amount per month was greatest in corn and least in meadow (Table 3). The volume of runoff from all crops was less under the improved practice system. The greatest reductions per month occurring as a result of the practices were in the corn season, and the least in the meadow season.

The reductions in both peaks and amounts of runoff were analyzed statistically. In both cases, the differences beween the two treatments were significant, i.e., they were not due to chance alone. The data on both runoff and soil erosion showed the effects of soil type (2). A more detailed account of this is given in an unpublished Station report.

Growing and Dormant Season Runoff

During the summer when rainfall intensities were high, peak rates were also high (Table 4). Runoff amounts, however, were relatively low. Summer storms are characterized by short duration and small areal extent. The surface storage associated with contouring and the dense growing wheat and meadow covers allowed rains from average storms to get into the soil without

TABLE 4
Average Peak Rates and Amounts of Runoff by Seasons, Coshocton, Ohio, 1945-1956

	Growing Season May 1 to October 10	Dormant Season October 11 to April 30
Average peak rate, In./Hr.[1]	0.83	0.22
Average runoff, Inches[2]	.38	.81

[1] Average of maximum seasonal peak rates.
[2] Average of total runoff for the seasons.

runoff. The occasional intense storm overpowered these conditions and caused a flashy type of runoff having high peak rates but not great volume.

Table 4 shows just the reverse picture for the dormant season. Rainfall intensities were low and peak runoff rates were also low. These winter storms, however, were associated with long duration and wide area coverage. The soil was generally at or near saturation. Runoff tended to continue over longer time periods.

Upland watersheds in the Ohio River Basin are normally in little danger of flooding in the dormant season. Dormant season runoff, however, is the cause of large basin floods (3). Then thousands of small areas furnish water at the same time to major river channels. Can a land-use program alone help reduce these floods when the soil is already near saturation? Perhaps a little but probably not to any great extent in this area. There simply is not space available in the soil for additional water storage when these major floods occur. On-stream protection works are needed to handle the excess waters.

During the growing season, large basin floods are rare. On small upland areas, however, flood danger is common. Here, improved practices may play a major role. High rates of evapotranspiration deplete soil moisture and open up a reservoir of storage space for water in pores. Land-use practices are being developed through research to store more water in the soil reservoir and to reduce peaks. Thus the damage of small area summer floods may be lessened.

Table 3 shows impressive reductions in peaks and amounts of runoff from corn under improved practice. Is the reduction big enough? How much of the soil storage space has been used? In another experiment, mulch tillage when added to the standard improved practice for corn reduced peaks from 0.94 to 0.45 inch per hour and total runoff, from 1.09 inches to 0.77. The standard improved practice was effective—but appears to be far from optimum.

Soil Loss

The amounts of erosion as measured by soil loss from the watersheds are given in Table 5. The soil loss from the improved practices are strikingly less than from the prevailing practices—especiallly for corn. Losses from wheat land were much less than those from corn, but improved practices again made a sizable reduction in the amounts lost. No more than a trace of erosion has been recorded when the watersheds were in grass. The overall reduction due to the improved practices was statistically significant.

The soil loss picture during one major storm was of interest. On June 12, 1957, the watersheds received almost 3½ inches of rain in one hour. A storm with so great an hourly intensity would be expected to recur about once in over 200 years. Runoff amounts and peak rates were high on watersheds under both practices. Yet, under this extreme condition, erosion losses were reduced from 6.74 to 2.66 tons per acre under corn and from 0.93 to 0.04 ton per acre under wheat by the improved practice.

TABLE 5

Average Soil Loss by Crops in 4-year Rotation, Coshocton, Ohio, 1945-1956

Crop	*Time on Land*	*Soil Loss per Acre*	
		Prevailing	*Improved*
		Tons	*Tons*
Corn	May 1 to October 10	7.70	2.03
Wheat	October 11 to April 30	.88	.14
Meadow	33 months	Trace	Trace
Total for 4-year rotation		8.58	2.17

Crop Yields and Economics*

The yields of all three crops in the rotation for each year are given in Fig. 3. In addition to the yields for

*The assistance of Mark M. Regan, Assistant Head, Land and Water Section, Farm Economics Research Division, ARS, USDA, in planning the analysis and calculating the expense items and crop values is gratefully acknowledged.

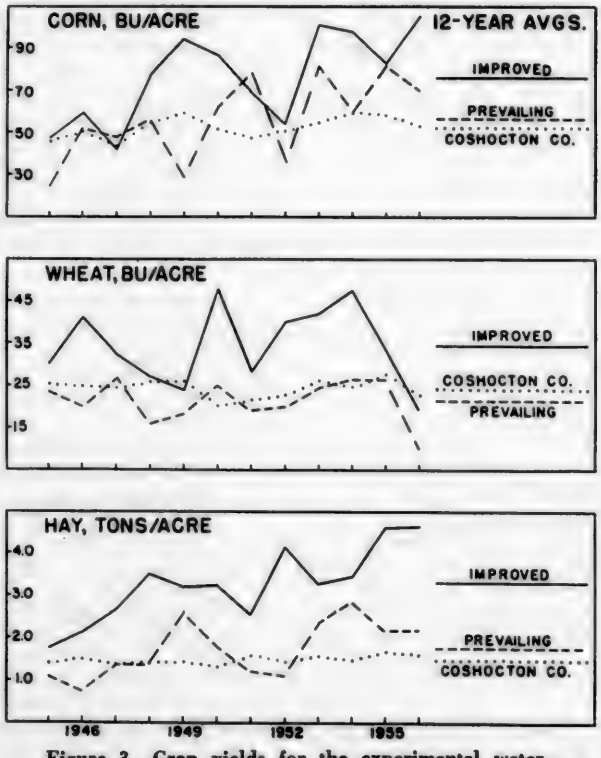

Figure 3. Crop yields for the experimental watersheds at Coshocton, Ohio, and for Coshocton County.

both improved (treated) and prevailing (untreated) watersheds, Fig. 3 also gives the average yield for all farms in Coshocton County. The county average over the period of record was close to the average of the prevailing or untreated watershed.

To analyze the economic aspects of the two farming systems seemed more appropriate than to analyze the yields per se. The farmer must be a business man. More than savings of soil and water will be needed to convince him that one farming system is better than another.

Accordingly, the watershed yields shown in Fig. 3 were converted to dollars and cents of gross income. The added expenses of applying improved practices were calculated from actual commercial prices. The increased costs of harvest were allowed for at custom rates. The total of these increased expenses were deducted from improved practice income to obtain the net income. The difference between this amount and the gross income from prevailing practice was the profit or loss on improved as compared to prevailing practice. A more comprehensive economic analysis of the influence of farming practice on similar soils has been made by Blosser (1).

As an average of all crops and years, improved practice returned $18.71 extra net income per acre over prevailing practice. This difference was statistically significant at the 10 per cent level. That this was a difference in net income from one acre in one year must be emphasized. All extra expenses of improved practice had been deducted. Under improved practices, the gross income from crops produced increased from $45.04 to $74.74 per acre per year.

To illustrate the practical importance of the $18.71 extra net income per acre, the following calculation was made. The total 1956 net farm income for Ohio (5) was divided by the acreage of farm land (4). The average net income in 1956 for one acre of Ohio farmland was $36.24. Since Coshocton County yields were somewhat below state average (4), $36.24 was probably an overestimate for the vicinity of the Station. Even so, the increase for improved over prevailing practices amounted to a 52 per cent increase in average net income.

The increased net income showed a significant ($r = 0.62$) increase with time during the 1945-1956 period. This indicated that the effects of good management were cumulative. Undoubtedly, there is a top limit to a trend of this sort. However, it has not appeared yet in this 12-year record.

To isolate the effect of any one particular measure in this analysis was impossible. The systems must be evaluated as a package. As a whole, the improved practice system is clearly superior.

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Communication in a Forestry Agency

KENNETH J. SEIGWORTH

"Communication . . . provides the thread that binds an organization together by ensuring common understanding."

THIS DEFINITION, originating with Pfiffner and Presthus[1], describes an integral part of all forestry organizations. Far-flung geographically, as they often are, and dealing with the many phases of government, botany, engineering, economics, hydrology, meteorology, psychology, and philosophy that concern foresters, such organizations tax the strength of the communication thread.

The "system," reported here as a case example, is a product of several years evolution and is currently followed by the Forest Development Branch, Tennessee Valley Authority Division of Forestry Relations. (For

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[1] *Public Administration, by Pfiffner and Presthus, Ronald Press Co., 1953.*

purposes of brevity and clarity, emphasis is placed on the internal and vertical rather than on the external and horizontal flow.) The system has been fairly successful. Its constant aim is to make sure the "last man" in the organization knows the purpose of his activities and those of his fellow workers.

The Forest Development Branch along with the Forestry Investigations and Fish and Game Branches comprise the Division of Forestry Relations. The Division director reports to the general manager of TVA.

Forest Development plans and conducts a program that combines a variety of exploratory and demonstration projects in forest management, protection, utilization, and reforestation, including the operation of two sizable tree nurseries. The program is active in the Tennessee Valley portion of seven states. It involves understanding of state programs and close cooperation with the departments of conservation and the land-grant colleges of these states. It involves similar association with some 40 to 50 related state, federal, and private agencies and organizations, and with hundreds of cooperating landowners and forest industries. Personnel (22 professional foresters, about a dozen technical aides, seven clericals, and 10 to 60 seasonal laborers) are spread among nine locations—some over three hundred miles from the central office. The flow-of-information problem could scarcely be more complex if the group were ten times its present size. To operate with any degree of effectiveness, members of our group at each location must be well informed. They must know currently, accurately, and in detail about affairs in their own branch and division; they must know in general about the wide range of activities of the entire TVA; they must keep well informed about state and national forestry policies and programs and be acquainted with related natural resource programs.

Elements in the communication process might be catalogued as follows:

Recruitment—For the technical jobs, we try to select alert graduates of the accredited professional schools who show promise of development into group rather than highly specialized individual workers.

Orientation—Each new professional and clerical employee gets from one to three weeks orientation about programs, policies, and cooperating organizations. Both the supervisor of his orientation training and the Branch chief satisfy themselves through personal discussion that there is clear understanding as to basic branch objectives and policies. These objectives are to develop the full forestry potential of the Tennessee Valley region for watershed protection and economic contributions. As basic policy, this is accomplished by means of landowner and industry education through demonstration and working with and through the key cooperating state agencies. The new employee isn't given a job assignment until he has a good understanding of such matters.

Program Development—At appropriate stages every technical employee participates in the formulation and periodic review of long- and short-term goals and in the preparation of annual work plans and budget documents. When these are reduced to writing, each employee receives copies for his individual use. He has the opportunity to know as much about what the group is trying to accomplish as does the Branch chief or Division director. Supervisors are expected to be alert for and encourage ideas and suggestions concerning program and for doing current work more efficiently.

Staff Conferences—Branch meetings of key personnel from each geographic area are held at infrequent intervals—probably two to four times a year. There just doesn't seem to be the need for regular or frequent group conferences.

Personal Discussions—These occur frequently as the need arises—among supervisors and subordinates at all levels, among coordinates in the Branch and Division, and with representatives of cooperating agencies. Concise telephone discussions seem to be the best substitute for personal meetings. While liberal use of the telephone is expensive, it is still more expeditious and less costly than travel.

Manuals—TVA issues and keeps current a three-volume document labeled "Administrative Releases." This is a meticulously coordinated compendium of policy, administrative organization procedures, delegations, and management standards. Each field office and nursery has a copy. Each technical and clerical employee has ready access to it and is expected to be moderately familiar with its contents. Associated with the TVA-wide releases are a smaller number of Division instructions dealing with specific forestry and fish and game objectives and policies. Each Division employee receives copies of these.

Handbook—Another important informational document is the *TVA Handbook*. This is a 400-page notebook containing statistics and explanatory text about most phases of TVA. A copy is assigned to each field office and nursery. All personnel are encouraged to use it. The *Handbook* is loose leaf and current releases keep it up to date. It contains some fifty subject breakdowns on a wide range of agency and regional data: e.g., the TVA Act, agricultural trends and statistics, dams, forestry, litigation, merit system, navigation, patents, population, power, visitors. Its ready availability indicates to every employee that "top brass" are withholding no secrets. Within reasonable limits, he is as well equipped to answer questions about his agency as is the director of the Information Office.

Background Materials—There is a continuing two-way flow of what might be called background material. While selectivity is exercised, the volume of such material is moderately heavy. Each person in the organization is on the lookout for material that will be of interest and possible use to others in helping them do their jobs more effectively. This attitude seems to permeate TVA. From the top, the general manager's office and other division directors try to insure that our Division director knows about all developments that may affect the TVA program.

Such developments may occur outside as well as inside the TVA organization. Written material includes such items as copies of proposed legislation, copies of pertinent general manager and board of directors correspondence, speeches by key staff members, occasional white papers (e.g., coal-buying policy and practice, how the 1957 flood was handled, regional population and income trends, news releases and agenda for board meetings). Our director in turn sees to it that such material reaches the three branches of the Division of Forestry Relations.

There is a similar but opposite flow of material from our field offices and nurseries through the Branch to the director, to others in the Division, and to the general manager's office. The Branch chief receives copies of *all* field office incoming and outgoing correspondence. In addition, the field offices are sensitive to the need for keeping central offices informed of state legislative proposals, program developments, personnel changes, and related occurrences in the areas and agencies they work with. Other branches within the Division watch for and pass along information of interest to us. The point to be emphasized, I think, is that this is now a traditional rather than a casual process; everyone works at it, but in a relaxed, intuitive sort of way.

Some Components of Communication

Periodic Reports—As in many public agencies, each unit is required to submit monthly reports. These include progress made, problems encountered, and other developments related to work plans. Rather than being regarded as a routine chore, the reports provide an opportunity for perspective evaluation of progress. I find the field reports consistently interesting and informative. Together, they form the basis for our report of activities to the Division director.

Job Descriptions—Each employee's job description notes his responsibility for continuing analysis, appraisal, and reporting of forestry progress in his part of the region. This is an important element considered by the supervisor in annual evaluation of total performance. It seems to be an effective reminder of the vital need for information flow.

Special Written Instructions—Infrequently, the needed arises for instructions to supplement previously prepared work plan and policy statements. So as to insure clarity, common understanding, and enthusiastic concurrence, such instructions ordinarily are issued only after review or discussion among key members of the Branch.

Secretarial Participation—Secretaries in the central and field offices are recognized as essential participants in the operation of the information system. They sit in on discussions, read much of the material reaching the supervisors, and are encouraged to ask questions. They understand what the organization is trying to accomplish, the policies that guide operations, and the agencies with which we work. They sense the need for rapid and continuous flow of information and exercise a high degree of autonomy in its routing.

Attitude and Values

The more tangible components of our communication system are, I think, included in the above listing. Reflection over the years, however, persuades me that the list is incomplete without inclusion of what, for a better term, I call attitude. Like morale, it's an evasive intangible. I am convinced that without a healthy attitude, individual and organizational, toward information-flow any system will collapse or fail to be effective. In essence, both employee and supervisor must be interested in and work at (a) keeping themselves informed, (b) keeping others informed, and (c) keeping informed about the right things. Like confidence, it is a two-way street.

There must also be a well-developed sense of values as to the distinction between items of program or organizational concern and those of only individual concern. Perhaps the system helps create the attitude; certainly attitude determines workability of the system.

* * *

I wouldn't want to leave the impression that our system has achieved perfection. It hasn't. But it works and it's the best we've been able to develop to date. Occasionally the cogs don't mesh as they should. When this happens repeatedly, the trouble is analyzed and new methods are tried. ■

How to Determine Required Width of Field Strips to Control Wind Erosion

W. S. CHEPIL

EARLIER studies (1), (2) have indicated that the rate of soil movement begins with zero on the windward side of fields or field strips and increases with distance downwind. The more susceptible the soil is to wind erosion, the greater is the rate of increase in soil flow with distance downwind and the narrower the strips have to be to keep erosion from exceeding a tolerable minimum.

To determine how wide field strips must be, it is necessary first to estimate the susceptibility of the soil to erosion by wind. Best indices of wind erodibility are the state and stability of dry soil structure. The state of structure is the percentage of nonerodible dry aggregates (clods) greater than 0.84 mm. in diameter determined by dry sieving. This percentage is known as index I. The stability of structure determines how rapidly the soil clods and surface crust will disintegrate from the bombardment of bouncing soil grains after erosion has started. An index of stability of structure is soil texture. It is designated as factor F.

The required width of fields or field strips along prevailing direction of wind for any farm or area belonging to some particular soil type or class may be determined as follows:

1. During March or April on a field undisturbed by cultivation since the previous fall, determine soil cloddiness by dry sieving as outlined previously (3). This is the time of the year when high winds are most likely to occur and the soil is most erodible by wind. At least ten determinations are necessary to overcome the influence of soil variability. Assuming a negligible ridge roughness equivalent K_1 of 1 inch and negligible quantity of crop residue R_1 of 100 pounds per acre on the surface, determine natural soil erodibility IR_1K_1F by use of Figure 1 and Table 1 as follows:

   Pass straightedge through the percentage value of clods greater than 0.84 mm. on line AB and through the value of R_1K_1 of 100 (the product of 100 pounds per acre of crop residue and 1 inch ridge roughness equivalent) on line EF of Figure 1. The wind tunnel erodibility value corresponding to these conditions lies at a point where the straightedge crosses line CD. The wind tunnel erodibility is then multiplied by an appropriate factor F (Table 1) depending on soil texture, to indicate natural erodibility as would occur under field conditions.

2. Locate the mean value of natural soil erodibility on the extreme left of Figure 2. Move from this point to the right along or between and parallel with thick erodibility lines until the dashed line is reached.

3. Move from this point straight down and read the required width of field or field strip along prevailing direction of wind. This is the distance between points in the field where erosion begins to where the rate of soil flow will be increased to a tolerable rate of 0.2 ton per rod width per hour for wind velocity of 40 miles per hour at 50-foot height if residue and roughness are negligible. This distance is designated as d_t.

Since wind direction varies, the best that can be done is to orient the fields or field strips with broad sides running as nearly as possible at right angles to the prevailing or average wind direction. If the prevailing direction is other than at right angles to the field strips, the width of strips has to be reduced by the factor of Cosine A where A is angle of deviation from perpendicular to the strips. If A is greater than 45 degrees and the sides of strips must run north-south and east-west, then the strips must be turned 90 degrees so A will be less than 45 degrees.

The required width of field strips for any prevailing direction of wind may be determined from the alignment chart of Figure 3. It can be used as follows:

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Contribution from Soil and Water Conservation Research Division, Agricultural Research Service, USDA, with Kansas Agricultural Experiment Station cooperating. Department of Agronomy contribution No. 654.

TABLE 1

Factors for conversion of wind tunnel erodibility to natural erodibility on a field-scale basis

Soil textural class	*Factor F*
Fine sand	6
Loamy fine sand	4
Fine sandy loam and clay	2
Loam, silt loam, clay loam, silty clay loam	1

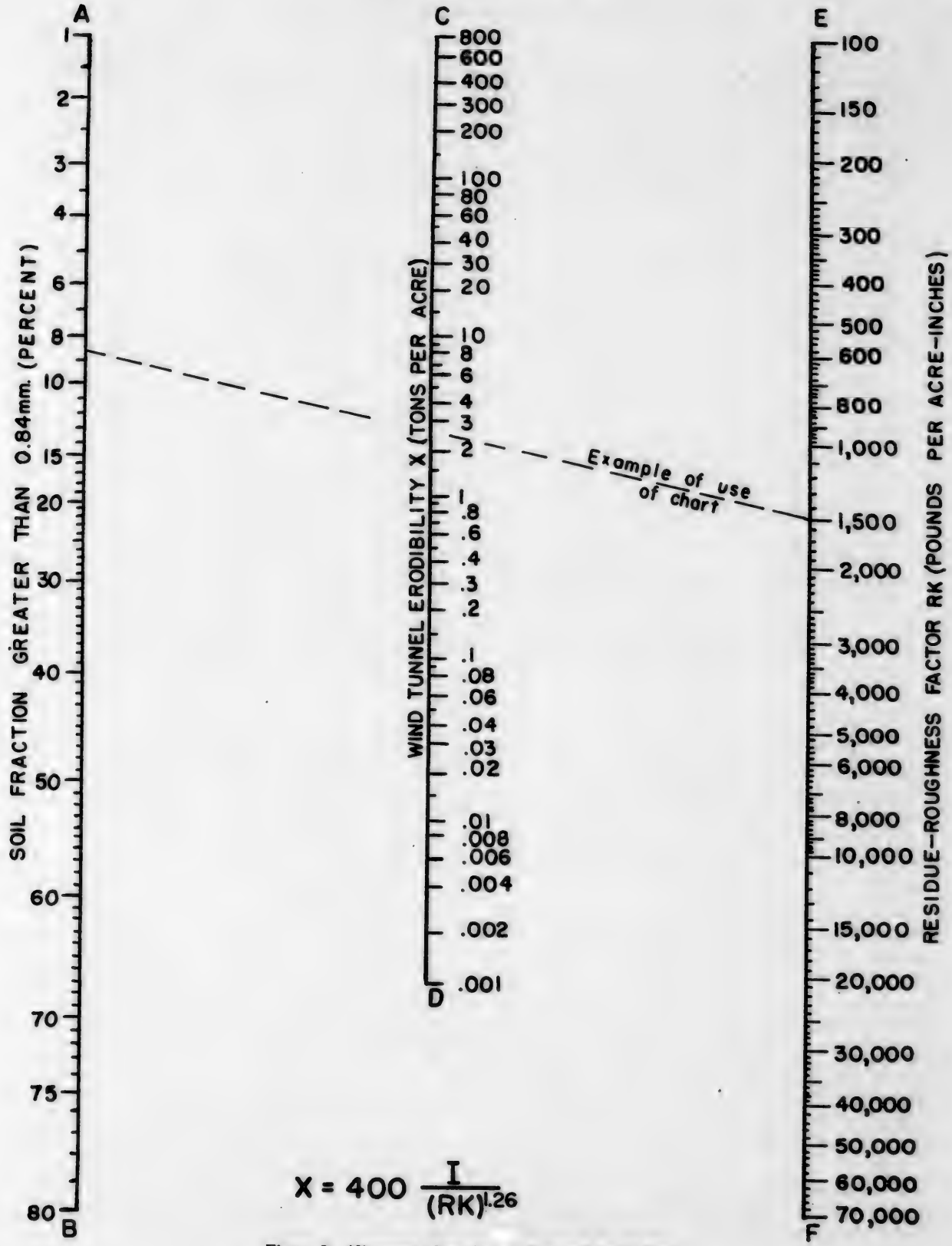

Figure 1. Alignment chart for wind tunnel erodibility.

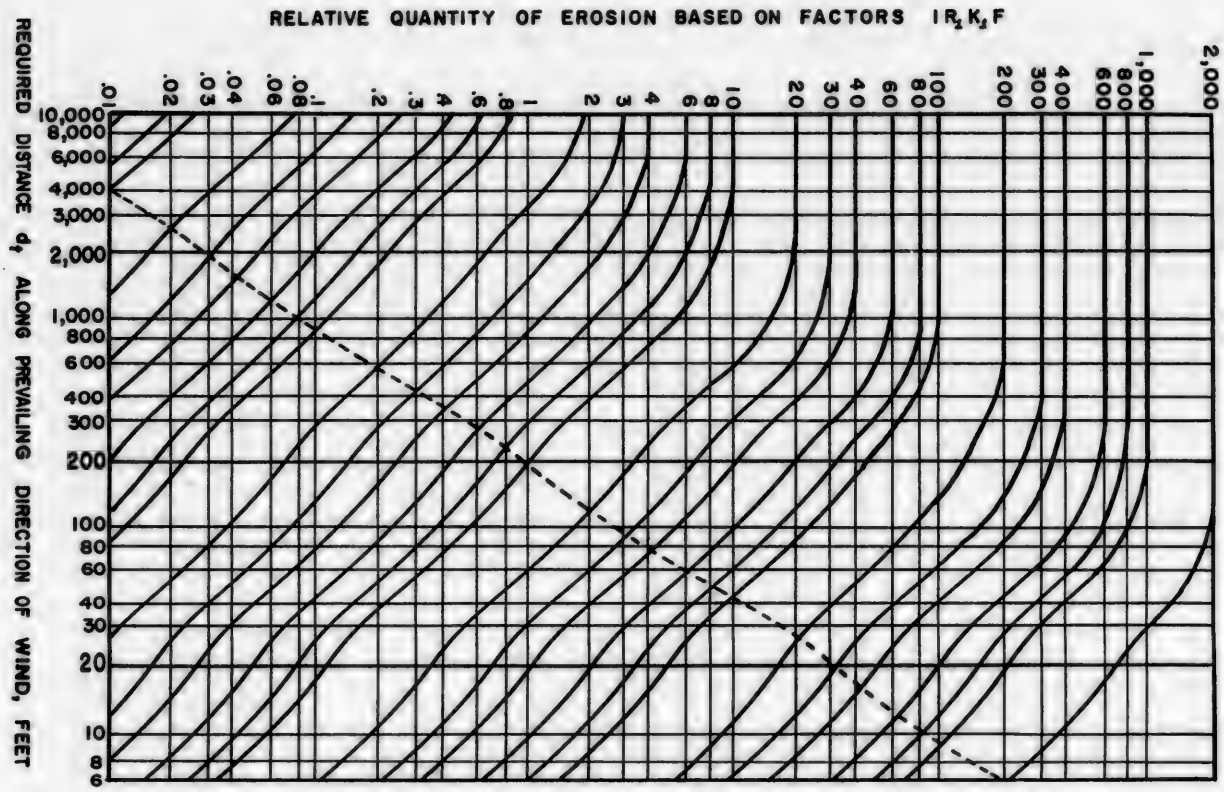

Figure 2. Chart showing the relationship between soil erodibility and distance across the field along prevailing direction of wind required to keep the rate of soil flow from exceeding a tolerable limit if wind velocity does not exceed 40 miles per hour at 50-foot height.

A straightedge is passed through the required distance d_t across the strip along prevailing direction of wind on line AB and through the angle of deviation of prevailing wind direction from perpendicular to the strip on line CD. The required width of field strip is indicated at the point where the straightedge crosses line EF.

The required width of field strips as determined from Figure 3 can be widened to the extent each strip is fully protected from wind by standing crop or stubble or some other barrier on its windward side. The fully protected zone for a 40-mile per hour wind velocity and a most erodible soil extends for a distance equal to about 10 times the barrier height. Few barriers of any consequence exist in dry areas subject to wind erosion. For stubble, on the other hand, the distance of full protection is relatively small. Therefore, it may be disregarded and considered as an additional safety factor against erosion by wind.

The required width of field strips is based on the tolerable rate of soil flow tentatively set at one-tenth the possible maximum rate of 2 tons per rod width per hour for a 40-mile per hour wind velocity at 50-foot height. The tolerable rate is not a negligible or insignificant rate. It is the rate that will occur if crop residue cover, soil cloddiness, and surface roughness are reduced to the minimum. In addition to strip cropping, the farmer should maintain the crop residues, soil cloddiness, and surface roughness at a maximum desirable level. The required width of strips is that which requires for control of wind erosion the quantity of crop residue, degree of surface roughness, as well as soil cloddiness that can be obtained with some degree of assurance with proper farming practices in years of limited precipitation, high wind velocity, and low crop yields. The system, even then, will fail occasionally, although rarely.

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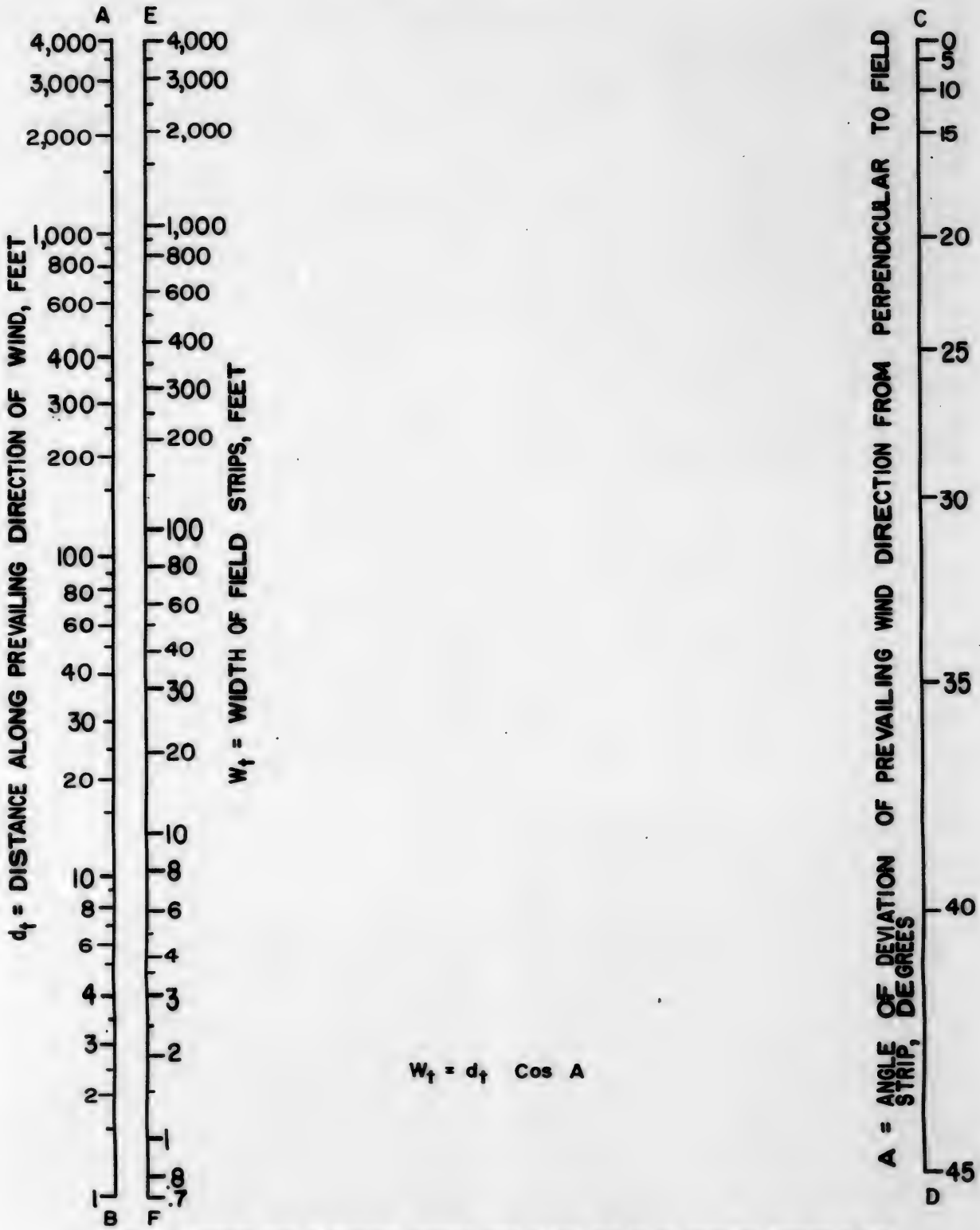

Figure 3. Alignment chart to determine required width of field strip for any prevailing direction of wind.

Renewing Permanent Pastures with Minimum Soil Tillage

A. E. PETERSON

IN 1957 A STUDY was started to see if interseeding of alfalfa in corn and wheel-track planting of corn could be combined to re-establish successfully pasture in one growing season and obtain a crop of corn. Recent developments in corn tillage practices have indicated that corn can be grown with little or no soil erosion, using either mulch planting (8, 9), or the wheel-track planting where corn is planted on freshly plowed ground in a seedbed prepared by the wheels of the tractor pulling the corn planter (7). The possibility of establishing forage crops in corn has received considerable attention in recent years (2, 3, 10). Studies combining wheel-track corn planting with establishing alfalfa in wide row corn started in 1954 at Wisconsin (5).

The studies to determine if these methods could be combined to successfully re-establish pasture were located in Iowa County on the unglaciated soils of southwestern Wisconsin and near the same area where the original work on pasture renovation was conducted (1). In 1957, the plots were located on a 15-year-old bluegrass pasture (12% slope). In 1958, these plots were located on a 40-year-old bluegrass pasture (8% slope). The soil was a slightly acid (pH 6.2) Sogn silt loam (shallow Dubuque). The plots used in 1957 contained high amounts of available nitrogen, phosphorus and potassium. The 1958 plots contained medium amounts.

The fields were plowed and the corn was wheel-track planted (Fig. 1) on June 15, 1957, and on June 6, 1958. Forty and 60-inch wheel-track rows were obtained using a John Deere 420U tractor and a Ferguson D PO-21 tool bar corn planter. Starter fertilizer was drilled at the rate of 300 pounds of 5-20-20 per acre. Before cultivation 400 pounds per acre of 0-10-30 were broadcast. When 8 to 12 inches tall, the corn was sidedressed with 150 pounds of ammonium nitrate, cultivated once and interseeded with the modified cultipacker seeder (Fig. 2). Conventional cultipackers used previously for interseeding left a smooth soil surface that was subject to serious erosion, while the modified cultipacker seeder left an irregular soil surface and still firmed the soil around the seed for good germination (6). The seeding mixture consisted of 10 pounds of Vernal alfalfa, 6 pounds of bromegrass, and ½ pound of ladino clover. Original plans were to use herbicides to control weeds but this was unnecessary because most of the viable weed seeds were buried by the deep plowing for wheel-track planting the corn.

Soil losses were estimated by plowing a dead furrow at the bottom of the plots and banking of the margin of the plots so any runoff had to go into the furrow. Re-

A. E. Peterson is Associate Professor of Soils, University of Wisconsin, Madison, Wis. *This paper is published with the approval of the Director of the Wis. Agr. Expt. Station. Iowa County Agricultural Agent Everett Olsen, and Iowa County farmers Daniel McGraw and William McDermott provided land and assistance for this study. Eastern States Farmers Exchange provided the 602 dwarf corn and Brillion Iron Works, Brillion, Wis. provided the experimental alfalfa seeder.*

Figure 1. Wheel-track planting of corn in 60-inch rows on 12 per cent slopes on pasture renewal experiment, Iowa County, Wisconsin, 1957. Rough condition of field after planting aided in reducing soil and water runoff.

Figure 2. Modified cultipacker seeder used to interseed alfalfa in corn on pasture renewal experiment. This implement left an irregular soil surface and still firmed the soil around the seed for good germination.

cording rain gages were used to measure the intensity as well as the total precipitation.

The amount of light reaching the low-growing legumes in the corn rows of various widths was determined using the photo-electric instrument designed by Miller (4). In 1957 the corn row direction was north and south, whereas in 1958 it was east and west.

Dwarf corn (Brachytic$_2$ type) was included in the 1958 study (Fig. 3) to determine the feasibility of seeding alfalfa in 40-inch dwarf corn rows.

Figure 3. Dwarf corn (brachytic$_2$) planted in 40-inch rows and interseeded with alfalfa yielded 92 bushels per acre on pasture renewal experiment.

Experimental Results

The precipitation in 1957 and 1958 during June through September was about normal and no appreciable runoff occurred. However, in 1958 the rainfall for the entire year was only 20 inches or about two thirds of normal so the soil actually was drier than usual. In 1957 an intense 1.8 inch rain (1.60 inch per hour for 15 minutes) occurred the day following the corn planting but no soil loss or runoff occurred.

Excellent alfalfa cover was obtained by August 15, 1957, only 5 weeks after the alfalfa was seeded (Fig. 4), and two months after the field had been plowed and corn planted. Adequate plant food, good seeding methods and absence of weeds made this growth possible.

The corn yields (Table 1) indicate that both the 40-inch and 60-inch rows produced excellent yields, certainly comparable to regular corn fields in the area. Some of the yield differences are due to difficulties of obtaining as large a plant population in the 60-inch rows as in the 40-inch rows. The dwarf corn planted in 1958 did not fully mature, resulting in a lower yield.

TABLE 1

Yield and population of wheel-track planted corn on pasture renewal experiment, Sogn silt loam soil, Iowa County, Wisconsin, 1957 and 1958

Row Width	1957[1]		1958[1]	
	Plants/A	Yield	Plants/A	Yield
40″	17,200	86.0	19,000	104.2
60″	14,900	74.1	17,300	102.8
40″ Dwarf[2]	—	—	19,300	92.0

[1]Average of duplicate plots
[2]Brachytic$_2$ type dwarf corn

The alfalfa stand counts and forage yields (Table 2) indicate that satisfactory alfalfa stands were obtained in all treatments. The stand counts in the 40-inch rows of dwarf corn were about equal to those in the 60-inch rows of regular corn. The alfalfa seeded in 40-inch rows of regular corn was not as vigorous during the seeding year as the alfalfa seeded in the 60-inch corn rows. This is reflected by the reduced yields during the first year of pasture. Growth difference was not nearly as apparent by the fall of the first pasture year as it had been in the spring.

TABLE 2

Alfalfa stand and forage yield of alfalfa interseeded in corn on pasture renewal experiments, Iowa County, Wisconsin, 1957 and 1958

Corn Row Width	Alfalfa Stand Count[1]		Alfalfa Yield[2]
	1957	1958	1958
40″	9.1	8.3	2.25
60″	16.2	9.2	3.21
40″ Dwarf	—	9.0	—

[1]Plants/sq. ft. at corn harvest (average of 10 counts on each of duplicate plots)
[2]Tons per acre of dry matter

Figure 4. Cover produced by August 15, 1957, of alfalfa seeded in 60-inch corn rows with modified cultipacker seeder on July 10. Field was plowed and corn planted on June 15.

The amount of light reaching the low-growing legumes in the various corn-row spacings is given in Table 3.

TABLE 3

Amount of light reaching low growing legumes seeded in corn rows of various widths on pasture renewal experiment, Iowa County, Wisconsin, September 20, 1958

Corn Row Width	Per cent of Light Reaching Alfalfa			
	9 a.m.	12 Noon	4 p.m.	Average[1]
40″	12	23	9	18
60″	22	29	18	25
40″ Dwarf	16	25	18	22

[1]Average of hourly readings (9 a.m. to 4 p.m., C.S.T.)

Previous studies have indicated 60-inch rows of regular corn provide adequate light for establishing alfalfa seedings. The light reaching the low-growing legumes in the 40-inch rows of dwarf corn was reduced from 25 to 22 per cent compared to the 60-inch rows of regular corn. However, the transmitted light in the 40-inch rows of dwarf corn did appear adequate for growth of the alfalfa as indicated by the stand count. The light readings were made at the maximum growth of the corn. Thus, it is likely that the light intensity relationship between the various treatments will never be less than that indicated in the table.

The yield of corn, stand of alfalfa and light intensity indicates that alfalfa-brome may be re-established in one growing season on permanent pasture using minimum soil tillage methods. Best results were obtained from seedings made when the corn was 8 to 12 inches tall and where weeds were not a problem.

Further study will be needed to determine whether or not 40-inch rows of dwarf corn will continue to be as suitable as the present 60-inch rows of regular corn.

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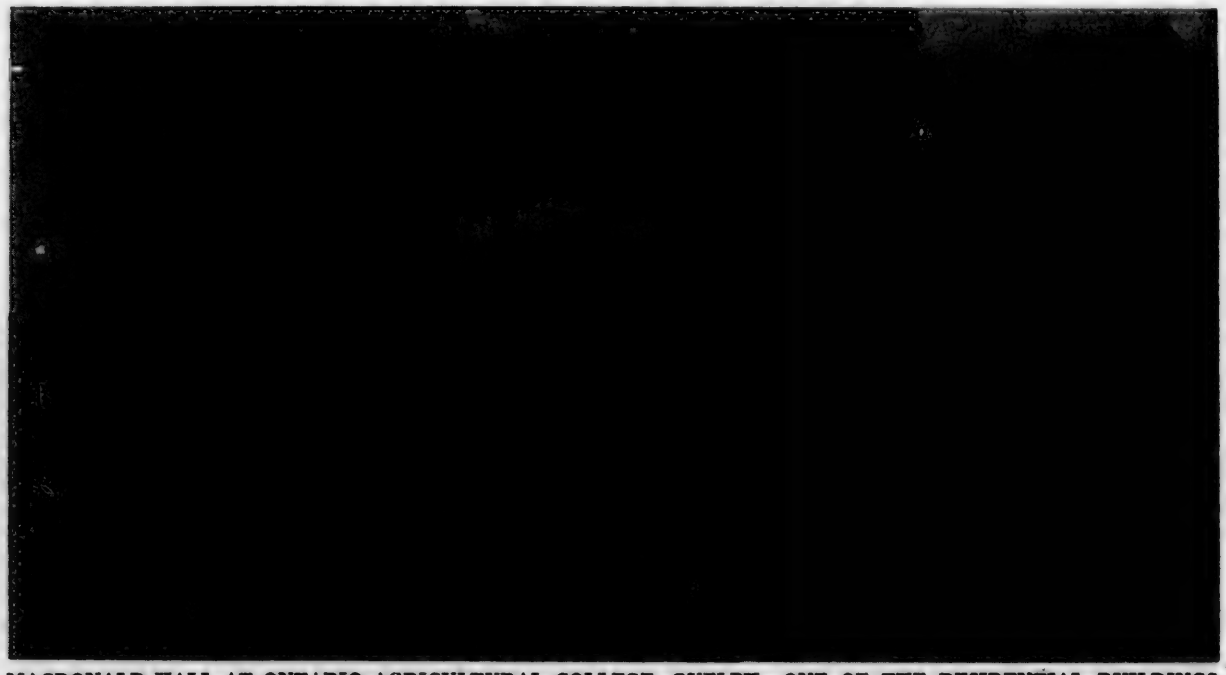


MACDONALD HALL AT ONTARIO AGRICULTURAL COLLEGE, GUELPH. ONE OF THE RESIDENTIAL BUILDINGS TO BE USED BY FAMILIES ATTENDING THE 15TH ANNUAL MEETING OF THE SOIL CONSERVATION SOCIETY OF AMERICA, AUGUST 28-31, 1960. FOR ADVANCE REGISTRATION, SEE FORM ON PAGE 87.

Field Notes

MORE FORAGE AND CONSERVATION FROM THE LAND

DID YOU ever put a good application of fertilizer on your pasture in the spring and think you did not get any results? If you are an average farmer, likely you have. You also probably blamed the fertilizer or the dry weather. Did you, however, leave enough stems and leaves to use the minerals supplied by the fertilizer?

A number of agricultural workers have made studies of the relationship between the amount of top growth and the root growth of several important pasture grasses in the United States. Many of these observations were made on bunch-type grasses and on grasses not common to pastures in the Southeastern States. To gain information on a sod-type pasture grass that might be typical of the Southeast, a series of tests were set up to observe how such a grass would respond to various clipping heights and intervals.

Pensacola Bahiagrass was used in these observations. Many agricultural workers and cattlemen agree that this plant can withstand more dry weather and rough treatment than any of the other improved pasture grasses common in the Southeast.

Ten motor oil cans of five-quart size were used to pot the grass. The tops of these cans were cut out and several small holes were punched in the bottoms for drainage.

On May 7, 1955, a sod of Pensacola Bahiagrass was transplanted to the cans. This sod was five or six years old, had never been grazed, and came from a wind-erosion site on a sandy knoll on a vegetable farm. The site probably had not been fertilized much either. However, the sod was dug from a small area of grass that had a darker color and was taller than the other grass around it. Grass sods as uniform as possible in appearance were selected. After transplanting, the grass was well watered and fertilized with a complete fertilizer (5-10-5) at the rate of 2,000 pounds per acre. All the sods seemed to have a better than average growth of tops and roots. No clippings were made at this time. The cans were numbered consecutively from 1 to 10.

During the test the grass was clipped as follows:

1. Cans numbered one and two—to one inch weekly.
2. Cans numbered three and four—to three inches weekly.
3. Cans numbered five and six—to one inch monthly.
4. Cans numbered seven and eight—to three inches monthly.
5. Cans numbered nine and ten—check—no clipping.

Each can of grass received similar fertilizer treatment and in every way each treated as nearly alike as possible. The plants were watered when there was not enough rainfall to keep them in a growing condition. Another application of a complete fertilizer (5-10-5) was made on July 9 at the rate of 2,000 pounds per acre.

The grass was too short for the weekly clipping on July 16 and August 6. The last weekly clipping was made August 13 and the last monthly clipping on July 30. Ammonium nitrate was applied August 13 to all the grass at the rate of 1,000 pounds per acre. The best looking can of each series was photographed on September 2. The grass sod was then removed from the cans, the soil washed from the roots and the plants photographed. The test was ended at this time because the grass clipped weekly appeared to be dying.

Figure 1 and 2 show the results obtained from the various clipping treatments. The yield of forage on a dry weight basis was graphed (Fig. 3).

In both the weekly and monthly clippings, there was an increase of 400 pounds per acre when the grass was clipped to 3 inches as compared with when it was clipped to 1 inch. There was a more pronounced increase in forage yield when clippings were made monthly instead of weekly. The monthly clippings to 3 inches yielded two and a quarter times as much forage as weekly clippings to the same height, and more than two and a half times as much as weekly clippings to 1 inch. The monthly clipping to 1 inch yielded nearly two and a half times as much forage as weekly clippings to the same height, and more than twice as much as weekly clippings to 3 inches. Even though leaving 3 inches of stubble was important, the month-long growing period between clippings was even more important. Monthly clippings yielded from two to more than two and a half times as much forage as weekly clippings regardless of height clipped.

Improved pasture is one of the best

Figure 1. Grass removed from cans and soil washed from roots showing effect on top growth and root development by various clipping treatments (*left to right*): unclipped; clipped to 3 inches monthly; clipped to 1 inch monthly; clipped to 3 inches weekly; and clipped to 1 inch weekly. (*Photos by C. B. Blickensderfer, SCS.*)

soil and water conservation practices. However, if ample root and top growths are not maintained, pastures of grasses and legumes will not do much toward increasing production and holding the soil and water in place.

The educational implications are of interest. Similar tests and observations are suitable projects for school groups and classes in conservation. Other pasture plants can also be used in such tests by school groups. Field trips to observe pastures and conservation practices are a logical next step following research on plotted grasses.—JOHN D. GRIFFIN, *SCS Area Conservationist, Lake City, Florida. (C. B. Blickensderfer, SCS Plant Materials Specialist, Sarasota, Florida, aided in this study. He made the photographs, weighed the clippings and undertook the conversions of fertilizer and clippings to pounds per acre.)*

Figure 2. (*Left to right*): unclipped; clipped to 3 inches monthly, yield of clippings 3.1 tons per acre; clipped to 1 inch monthly, yield 2.9 tons per acre; clipped to 3 inches weekly, yield 1.4 tons per acre; clipped to 1 inch weekly, yield 1.2 tons per acre.

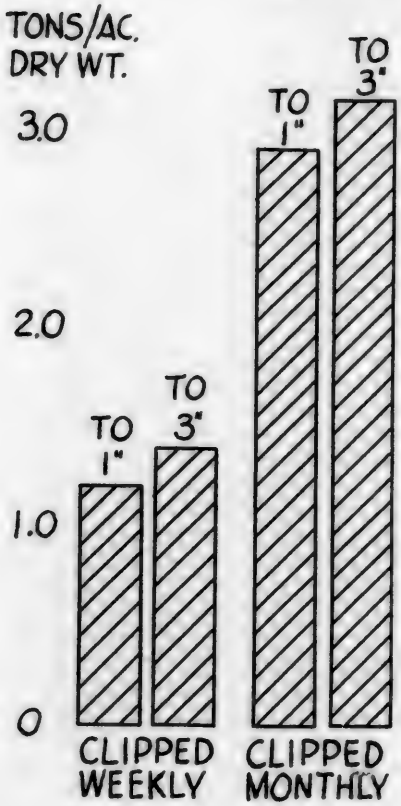


Figure 3. (*Below*) Total yield of forage from Pensacola Bahiagrass clipping tests, May 7 to September 2, 1955.

COMING EVENTS

The 28th Annual **Western Snow Conference** April 12, 13 and 14, 1960, La Fonda Hotel, Santa Fe, N. M. Rio Grande and Colorado River Water Supply Forecast committees will meet on the opening day. For further information write Berkeley Johnson, chairman local arrangements, P. O. Box 277, Santa Fe, N. M.

International Union for Conservation of Nature and Natural Resources, June 15-24, 1960, Warsaw and Cracow, Poland. For more information write Dr. Edward Graham (SCSA representative), c/o Soil Conservation Service, Washington 25, D. C., or IUCN, 31, rue Vautier, Brussels 4, Belgium.

Western Association of Game and Fish Commissioners (40th annual meeting) June 20-22, 1960, Motel Utah, Salt Lake City, Utah. For further information write Harold S. Crane, Director Utah Fish and Game Dept., Salt Lake City.

Midwest Fish and Game Commissioners Association annual meeting July 18-20, 1960, at the Sheraton-Johnson Hotel, Rapid City, S. D. For further information write Harry Woodward, Director, S. D. Dept. of Game, Fish and Parks, Pierre, S. D.

WORLD-WIDE ABSTRACTING AND INDEXING SERVICE

THE Colorado State University Research Foundation at Fort Collins, Colorado, U.S.A., recently received a grant from the National Science Foundation for the purpose of implementing and effecting a world-wide comprehensive Abstracting and Indexing Service in the field of Soil and Water. The undertaking involves a tremendous amount of work and organization, as well as the development of a cooperative effort among many agencies and organizations. They are exploring all aspects to determine the area of coverage, source of materials, availability of abstractors and translators, codification, general classification as to headings and, most important of all, the types of papers to be abstracted, as well as the kind of abstracts that will be most acceptable and useful.

As world population increases, the demand for more food becomes more urgent and the two most basic requirements of fertile soil and efficient use of water will inevitably receive more attention. Investigators all over the world need to know about significant contributions and discoveries by their contemporaries as soon after publication as possible. Many months, or even years, of unnecessary effort may be avoided by access to an up-to-date information service. It is hoped that the proposed abstracting service will more adequately meet the needs of investigators in this all-important field of soil and water.

Their office will welcome suggestions and ideas concerning any aspect of this undertaking, including offers to serve as abstractors, section editors and/or translators. The cooperation of all agencies and organizations related to this field of information will be welcomed. Correspondence should be addressed to:

Soil and Water Abstracting and Indexing Project, Colorado State University Research Foundation, Fort Collins, Colorado, U.S.A.

CONSERVATION IN SOUTHEAST NEW GRASS-CORN ROTATION METHOD

A NEW management method for corn and grass rotation, now under study by U. S. Department of Agriculture scientists, may be the answer to erosion and reseeding problems in southeastern states where corn is a major agricultural crop.

William E. Adams of USDA's Agricultural Research Service, in cooperation with the Georgia Experiment Station, has developed a means of managing a rotation of Coastal Bermuda grass and corn so the grass will re-establish itself without reseeding. Re-establishing grass after corn is harvested is a major expense to growers.

The four-year rotation used by Mr. Adams includes three years of Coastal Bermuda grass and one year of corn. After tillage and the planting of corn, the grass begins to recover, forming a good sod before corn-harvest time without interfering with corn production. This means the surface of the soil is unprotected for only about three months in the four-year rotation. A good hay crop can be cut the first year after corn is harvested.

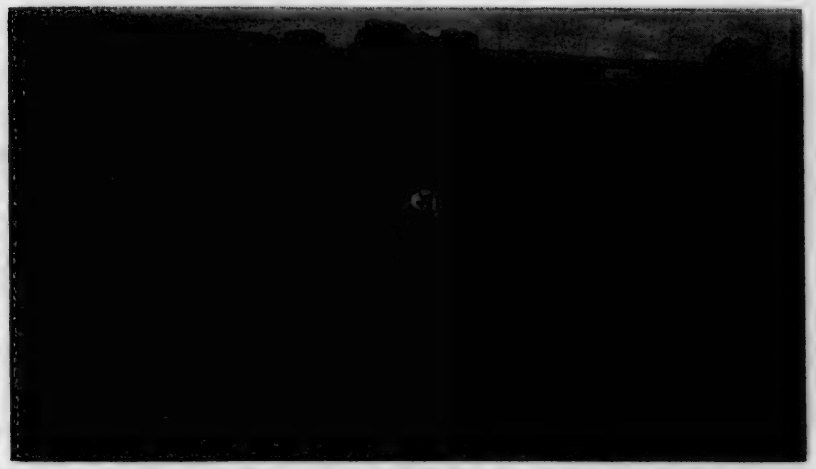
With normal corn production practices, the soil receives much less protection and erosion losses are greater than when a grass-corn rotation is used. In many areas the soil is fallow between corn plantings and subject to erosion. Application of this new management method may solve much of the erosion problem.

Unexpected dividends were received on two occasions when this area was subjected to hurricanes. Corn plots under normal management practices were flattened by the high winds and heavy rains. However, corn growing in the Coastal Bermuda rotations was held firm by the heavy sod.

At this time Coastal Bermuda is the only desirable grass that is known to work under this rotation management method. Therefore, the practice is now limited to areas where this grass can be grown—the southeastern states.

SOIL AND WATER LABORATORIES DEDICATED

Four new federal laboratories, under joint cooperation of Experiment Stations and the USDA to be devoted partly to basic research on soil and water, have been established and dedicated at Tempe, Ariz.; Morris, Minn.; Watkinsville, Ga.; and Oxford, Miss. More complete details on each can be obtained by writing the Information Service, USDA, Washington 25, D. C.



A good crop of hay can be harvested the first year after the corn in a four-year rotation of corn and Coastal Bermuda grass. Erosion hazards are reduced and corn yields are not affected. (*USDA Photo.*)

NEW ZEALAND ORGANIZING A CONSERVATION SOCIETY

Because there was no single body in New Zealand to whom an interested person might turn for information or for support in the promotion of conservation in any field, the New Zealand Association of Soil Conservators are exploring the possibilities of establishing a broadly-based Conservation Society of New Zealand.

Through such an organization it is expected an impartial forum can be established; the gap between laymen and diversity of official agencies (many now operating under diverse and opposing statutes and regulations) can be closed; and the public can be given greater satisfaction in conserving the beauty and productiveness of an unique landscape.

Those envisaging this proposed organization feel that a high-quality quarterly publication and annual conferences would do much to forward a more sensible and equitable approach to conservation throughout the country.

[For further information on this effort write to R. S. MacArthur, P. O. Box 204, Blenheim, New Zealand. He would welcome comments and suggestions from any interested person or similar groups elsewhere in the world.

Although the United States has many national conservation organizations, there does not seem to be in the United States any one organization that fits precisely into the broadly-based pattern conceived by the New Zealanders.

However, in the past few years, a number of states have developed Natural Resources councils or committees which bring together through meetings and published reports a variety of conservation organizations and agencies. This movement has in part arisen because of the differences that seem to exist in viewpoints and programs among many so-called conservation efforts. From such disparity has arisen confusion, misunderstandings and added conflict. These councils or committees seek in part to resolve or adjust differences.—EDITOR.]

POTHOLE PRESERVATION

The preservation of potholes will be portrayed on the 1960-61 federal migratory bird hunting stamp, commonly known as the duck stamp. Theme of the stamp is: "Wildlife Needs Water—Preserve Potholes."

Potholes are small water areas or marshes in Canada and the northern U. S. As nesting and resting areas, they are essential to the reproduction of wild waterfowl. Drainage of many wetlands, coupled with drought conditions, resulted in reduced waterfowl reproduction last year and fewer hunting opportunities during this past fall and winter.

The U. S. Fish and Wildlife Service, federal agency charged with administering migratory birds, will use all of the funds derived from duck stamp sales to acquire and preserve waterfowl wetlands, including pothole production areas.

In a unique plan to obtain funds to purchase needed wetlands, the Service's Bureau of Sport Fisheries and Wildlife is selling a special certificate signed by U. S. Department of Interior Secretary, Fred A. Seaton, along with a 1959 Duck Stamp at a price of $3.00. Orders accompanied by payment should be sent to the Bureau, Washington 25, D. C.

Soil Conservation. By Helmut Kohnke and Anson R. Bertrand. 298 pp., illus., refs., index. 1959. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. $6.75. (Reviewed by BEN OSBORN, Washington, D. C.)

Our shelf of books titled "Soil Conservation" grows apace. Each addition brings a different viewpoint and emphasis to illuminate another feature of this many-sided subject.

The latest addition is from a team of scientists at Purdue University. Helmut Kohnke is a research soil scientist with several years' experience with the Soil Conservation Service; Anson R. Bertrand is an agronomy professor with farming experience in the Southwest and Midwest. As might be expected, their new book reflects their agronomic viewpoint.

The strong feature of this book is its detailed treatment of the mechanics of soil erosion. The longest chapter, 98 pages, is devoted to this topic. In addition to the usual description and classification of erosion as "geologic" and "accelerated," or according to the causative agent as "water" and "wind," or according to its effects as "sheet," "rill," and "gully," this chapter examines the physical forces and processes involved in "the removal of soil from its original location."

The concept of erosion as a succession of steps—detachment, transportation, and deposition—that must follow one another in that sequence is explained and illustrated. The basic formulas for kinetic energy ($E_K = \frac{1}{2}mv^2$) and potential energy ($E_P = mgh$) are applied to erosion situations in a discussion of sources and forms of erosive energy. Falling raindrops are the major source of energy for detachment and flowing water for transportation. From an evaluation of rainstorm characteristics, the authors define "excessive rain" on the basis of intensity and duration.

These basic concepts are translated into principles of soil conservation, set out in a brief chapter of 10 pages. Here conservation is defined in terms of "permissible erosion." "Soil is continuously formed by nature. This rate is speeded up by man. Erosion should not exceed the rate of anticipated soil formation."

An erosion equation based on experiment station results shows soil loss to be related to crop rotation, management, slope gradient, slope length, conservation practices, and soil erodibility. The use of this equation is illustrated by examples from the corn belt as developed in the familiar "slope-practice guides" of the Soil Conservation Service.

The mechanics of wind erosion are explored in similar detail. The movement of soil particles by saltation, suspension, and surface creep is described and the factors of wind velocity and turbulence evaluated. But no corresponding soil-loss equation for wind erosion is provided.

The other big section of the book is an 82-page chapter on methods of soil conservation. This chapter is long not because of any new or unusual detail, but simply because of the large number of familiar practices treated. They are the methods of the corn belt and the humid east, plus a section on wind erosion control. Problems of western irrigated farms, or of range and forest land, are not treated.

Other chapters include sound but elementary discussions of soil, economics, farm planning, and the meaning of soil conservation. The philosophy is that of modern agriculture—that conservation is wise use and improvement, not merely preservation, of basic resources.

The book is written primarily as a college text, but its use is not limited to the classroom. The organization and style of writing make it understandable to any reader who is at all familiar with agriculture and conservation. Each chapter ends with a generous list of references to the important basic literature of the subject.

Food: The Yearbook of Agriculture, 1959. Alfred Stefferud (editor). USDA. 736 pp., illus. (U. S. Supt. of Documents, Government Printing Office, Washington 25, D. C. $2.25.)

The contributions of 72 nutrition experts are stacked into 65 chapters, covering just about everything known about foods; and including 36 pages of simple recipes which, if followed, would enable a person to eat some of the basic foods every day.

If you think you already know something about food, read this 60th Yearbook and find out how much more you can learn. An important book.

Economic Evaluation of Soil and Water Management Measures. By Melville H. Cohee. *Agricultural Engineering*, Vol. 40, No. 12 (Dec. 1959), pp. 740-745, illus. (Single copies 80c; ASAE, 420 Main St., St. Joseph, Michigan.)

Amplified with illustrations (cartoon style) prepared by Felix Summers, the author presents some of the recognized essentials of economic evaluation of soil conservation. "The paper . . . is concerned principally with tangible values of so-called conservation measures. The value of benefits produced from the measure is their exchange value, as measured by expected market price at time of accrual."

Serve By Conserving. Compiled by Jack Cox. 157 pp., illus. 1959. Arco Publications, 29 Great Portland Street, London W. 1, England. Price, 12s. 6d. Net. (Copies can probably be purchased through The Boy Scouts International Bureau, Commonwealth Building, Metcalf Street, Ottawa, Canada.)

The subtitle of this "international" Boy Scouts' book is: "The world problem of conservation, with special references to ways and means by which Scouts can help, and are helping, to conserve the wild-life and natural resources [locally]."

Cox has had to think about some eight million Scouts world-wide in preparing this book; this has placed a tremendous responsibility on one man.

Cox wisely approaches conservation through the basic fundamentals of nature study. Being a Britisher, he considers natural history in its broader aspects.

By and large, Cox has prepared a useful book, although some of the ideas he has presented are out-dated—especially the one involving the throwing back of small fishes. One photograph facing page 47 shows stones and debris cleaned from a reclaimed hillside in England and thrown in "a natural hollow nearby." The book also continues the fallacy of the Land Classification system relegating Class VIII lands as "ordinarily useful for wild-life." In spite of these criticisms, the book is unique and very worthwhile. It will lead many boys world-wide to a better appreciation of natural resources and the need for better housekeeping, especially where agricultural lands and waters are involved.

Symposium on Basic Research. By Dael Wolfle, Ed. 308 pp., illus. Publication No. 56. Amer. Assoc. for the Advancement of Science, 1515 Massachusetts Ave., N. W., Washington 5, D. C. Price $2.50 cash with order, otherwise $3.00. (Reviewed by CHARLES E. KELLOGG, Washington, D. C.)

Last May a highly significant conference on basic research was sponsored by the National Academy of Sciences, the American Association for the Advancement of Science, and the Alfred P. Sloan Foundation at the Rockefeller Institute in New York City. Scientific leaders in universities, industry, foundations, and government attended. This book includes the addresses and an excellent summary of the whole discussion.

Deep and thoughtful concern for the future of basic research is extremely urgent. Out of it has come our applied science and technology with such great potential for man's welfare and for his destruction, and, more important, for his understanding of himself and of his environment.

To most of us, the total sum of money used in the United States in the name of "research and development" seems large. It runs to about 10 billion dollars annually. Yet few realize how small is the fraction used for scholarly basic research. Certainly it is less than 10 per cent; and much of this is concentrated in a few fields.

Yet this report is not primarily a plea for funds, much more concern is felt for the conditions under which excellence thrives.

The summary points out that, "The quantity and quality of research depend upon the total social and intellectual life of the nation. As a consequence of general agreement on this relationship, much of the discussion was centered on the problem of achieving broader general appreciation of scholarship, and understanding of the importance of the total search for new knowledge."

And again the report states, "Money is needed for scientific research, and under current procedures scientists frequently have to devote a good deal of time to the task of getting adequate support. But the vehement statement just quoted and a good many other likeminded statements clearly said to government, to industry, and to other sources of support, 'In the interests of science, and in the interests of society, don't concentrate your financial support exclusively on science. Concentrate on intellectual quality and on helping universities to become broadly excellent.'"

These quotations merely suggest the tone of the book. The several essays defy brief summary, at least by this reviewer. All I can do is to urge this book for those deeply concerned with the future of free scholarship in our country and to quote the concluding sentence of the first essay (by Professor J. Robert Oppenheimer): "For if we do not treasure the great inheritance on which all our work and life are based, and understand the radical novelty and the gravity of the situation in which we find ourselves, there will be few of our children to ask again of the need for new knowledge."

Literature of Agricultural Research. By J. R. Blanchard and Harald Ostvold. 231 pp., indexed. 1958. University of California Press, Berkeley, Calif. $5.00.

An excellent reference that will be helpful to any researcher or library. There is no mention of the JOURNAL OF SOIL AND WATER CONSERVATION.

The Agricultural Research Center of the United States Department of Agriculture. 46 pp., illus. Agr. Inf. Bul. No. 189. 1958. U. S. Govt. Printing Office, Washington 25, D. C. 30c

How to Identify and Name Soils. By R. Earle Storie. Booklet. April, 1959. Associated Students' Store, University of California, Berkeley, California. Price, $1.00.

A well-organized and useful booklet. Should be of much use to students and teachers.

Land Use and Its Patterns in the United States. By F. J. Marschner. 277 pp., illus., end-pocket map: Major Land Uses in the United States. 1959. USDA Agricultural Handbook No. 153. For sale by the Supt. of Documents, U. S. Govt. Printing Office, Washington 25, D. C. (Price not listed.)

This is an important contribution to a more mature understanding of the pattern of rural land use in the U.S.A. A feature is the use of aerial photographs of 168 local areas.

The contents show the scope of the text, which is amplified by lengthy legends on each photograph: Summary; Background; Settlement, Division, and Use of Land; Physical Conditions and Land Use; Effects of Industrialization; Type-of-farming Areas; Yield-Improving Practices; Impact of Changes; Patterns as Recorded by Aerial Photographs; Guide to Photographs; and Literature Cited.

Handbook No. 153 is similar in some ways to Technical Development Report No. 52 (May, 1946), *The Origin, Distribution, and Airphoto Identification of United States Soils* by D. S. Jenkins et al., especially in the use of aerial photos. Marschner does not list this important earlier work published by the U. S. Department of Commerce, Civil Aeronautic Administration, Washington, D. C.

Demands for Handbook No. 153 should be heavy from among the agricultural interests, in particular. However, a loose-leaf folio of the 168 aerial views, preferably at double their present size and on heavier stock, would present educators and others with a powerful tool to teach many aspects of the arts and sciences of land use. Handbook No. 153 is too choice an item not to receive widespread use and many awards of merit.

Aboriginal Man and White Man as Historical Causes of Fires in the Boreal Forest, with Particular Reference to Alaska. By Harold J. Lutz. 49 pp., extensive list of references cited. 1959. Yale University School of Forestry Bull. No. 65. (Copies can be procured at $1.00 each from the Yale University School of Forestry, 205 Prospect St., New Haven 11, Conn.)

A fascinating study. Fire is one of the great forces employed by man in modifying the landscape. Fire prevention and control in Alaskan forests is due for increased attention. Lutz' publication furnishes much historical, sociological and psychological background.

Turbulent Transfer in the Lower Atmosphere. By C. H. B. Priestley. 130 pp., 22 figs., bibliog., index. 1959. University of Chicago Press, 5750 Ellis Ave., Chicago 37, Ill. $3.75. (Reviewed by W. S. CHEPIL, Manhattan, Kansas.)

The book deals with selected approaches to measurement of eddy flux, shearing stress of wind, heat transfer, and evaporation over land and water surfaces. It contains mostly new information not appearing in previous textbooks. Its brevity, unfortunately, requires seeking details from original publications. The bibliography presented is extremely useful. Suggested instrumentation and approaches to future work make it valuable as an aid for research and teaching.

Africa's Wild Glory. By W. Phillip Keller. 324 pp., illus., index. 1959. Jarrold Publishers (London) Ltd., 178-202 Great Portland St., London W. 1, England. Price, 35s net. In Canada it can be obtained through Messrs. Nelson, Fortes and Scott, 81 John St., Toronto, Ontario. Price not known. (Reviewed by D. E. WADE, Des Moines, Iowa.)

Keller, although born in East Africa, received much of his education in Canada where he obtained a degree in animal husbandry. Impelled by a great desire to study Masailand from the standpoint of helping its native people adjust to better conservation practices, he returned to Africa accompanied by his Canadian wife and children. They were returning to one of the few remaining great wilderness areas of Africa.

The Masai Reserve is big game country and Keller is a superb master of bushcraft and wildlife photography.

Keller is indeed no ordinary person. His deep understanding of the Masai people, his desire to master the native tongue, and his academic and practical knowledge of animal husbandry, range management, wildlife, and soil and water conservation unfold in beautiful prose in his book. The major theme of the book is that the Masai and their land and way of life are highly worthy of being preserved before the situation is marred beyond repair.

Africa's Wild Glory penetrates with great humanity to the deeper and nobler meanings of conservation.

Because the odds seem to be stacked against Masailand and its magnificent people and fauna and flora, a reader of Keller's book may get terribly depressed.

There is, however, another side—that of vision—and Keller's reporting should fire up the imagination of conservationists world-wide. Would it be possible, for example, through the forces and talents of the United Nations, to undertake a great conservation project in Masailand? To bring to successful fruition the dreams of restoration that Keller has envisoned for the Masai Reserve would give the conservation movement a tremendous boost among all the oppressed peoples of the world. But what of the philosophy, procedures, and methods that would be needed in restoring and not destroying the "wilderness aspects" of the Masai Reserve? Does so-called modern conservation as yet have the stuff that would enable the undertaking of such a total, interlocking, and delicate task?

Keller sketches in many background facts and makes many cogent suggestions, backed up by his intense studies. His style is simple and conversational—almost as if he were informally chatting with you about his experiences.

He feels a logical place to begin the awakening of the Masai to their own and the land's possibilities is in the schools. "Instead of emphasis on academic subjects," he says, "preference should be given to those related to the land, water, vegetation, and live-stock. Accompanied by practical demonstration, the tremendous importance of such subjects would become very real in their thinking." He suggests very interestingly that the bulldozer would be a substitute for willingness to war. The Masai were great warriors. "Any young, would-be warrior with a 'bulldozer' throbbing under his hand would feel the same surge of mastery and might that his forebears knew."

Africa's Wild Glory is a very worthwhile addition to the ever-growing world-wide literature of conservation. It should lead more conservationists everywhere to take a wider and immediate interest in Africa. In view of the speed at which piecemeal and undesirable developments move today, there is a sense of urgency in getting underway soon a great and coordinated conservation program in Masailand.

Unfortunately, Keller had to leave Africa because of ill health. He returned to Canada where he is now engaged in building a ranch at Penticton in British Columbia. Fortunately, though, he can write well and did prepare this book.

Facts Behind the Farm Problem. By Al Bull. 23 pp., illus. 1959. Reprinted from *Wallaces Farmer*, P. O. Box 1317, Des Moines, Iowa. Free on request.

An attempt to clarify some of the muddled issues on the farm front. Shows how we might deal with production more wisely and in a way that will conserve productivity of soils. Alvin Bull served as editor of the JOURNAL 1956-1957.

Michigan Whitetails. By David H. Jenkins and Ilo H. Bartlett. 80 pp., illus. (by Oscar Warbach). 1959. Game Division, Michigan Dept. of Conservation, Lansing, Michigan. (Listed for free distribution only, but probably restricted largely to in-state distribution.)

Management of the deer herd in Michigan is a complex land-use and human-reaction problem. This extraordinarily well-presented booklet is among the most recent devices developed by the Department to bring the facts before the people of Michigan.

"An excellent introduction to water resources . . ."—Journal of Soil and Water Conservation

WATER FACTS FOR THE NATION'S FUTURE

Walter B. Langbein, U. S. Geological Survey; and William G. Hoyt, formerly U. S. Department of the Interior

This timely book offers an authoritative survey of the uses and benefits of existing federal and state hydrologic data programs. Giving practical recommendations for future expansion and improvements, it outlines specific steps which must be taken if these programs are to furnish the information indispensable for intelligent management of our water resources. Many original suggestions are presented, particularly for improving the design of hydrologic networks. *"A highly constructive presentation of a subject of ever-increasing importance."*—SOIL SCIENCE. *A Conservation Foundation Study. 1959. 41 ills., tables; 288 pp.* $5

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Edited by a Committee headed by Charles H. Callison, National Wildlife Federation

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Charles H. Stoddard

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News Notes

PRESIDENT'S COLUMN

"TIME AND TIDE wait for no man." We find that things move extremely fast in the life, living, and affairs of a large national organization — particularly the Soil Conservation Society of America.

E. L. Sauer

As President of your Society, a brief accounting of recent affairs is in order. Attending a number of chapter annual meetings has impressed and gratified me with the zeal and enthusiasm with which you, the members of the Society, are tackling various tasks in the field of soil and water conservation. Membership response at the meetings is extremely good. The chapters have excellent programs at their annual meetings and an accounting of their work year indicates the wholehearted participation of members in the chapter activities.

—SCSA—

I met with the Ontario, Canada chapter at its annual meeting at Guelph on January 20; also with the Local Arrangements Committee and the chairman of the 1960 Annual Meeting Program Committee. You may be assured that our Canadian neighbors are going all out to have a most successful annual meeting at Guelph on August 28-31, 1960. The local Arrangements Committee plans innovations which are sure to please you. Professor N. R. Richards, chairman of the 1960 Annual Meeting Program Committee, Roy Hockensmith, vice-chairman, and their committee are projecting a lively and educational program for the technical sessions at the meeting.

—SCSA—

George Winchester, chairman of the 1960 National Membership Committee, and his national committee, as well as chapter membership committees, are hard at work on the 1960 membership drive. We have as a Society goal the attainment of a membership of 11,500 by the end of 1960. I urge each and every one of you to consider seriously your part in this drive and secure at least one new member during 1960.

—SCSA—

Harold "Dutch" Rhodes, chairman, and his Building Fund Committee have set as their goal the raising of a substantial part of the projected $100,000 cost of the new Society headquarters building during the year 1960. Here, again, the cooperation of each and every member is essential.

—SCSA—

The spring 1960 national council meeting is scheduled for Des Moines on March 14-16. Your participation through suggestions to your councilmen is anticipated. Council action will be reported in the next issue of the JOURNAL.

—SCSA—

The annual meeting of the National Association of Soil Conservation Districts was held at Louisville, Kentucky, January 31-February 3. Approximately 2,000 men (plus many wives who are members of the NASCD Ladies Auxiliary) participated in this meeting. Most of the program consisted of committee meetings and group work sessions. The forward look and active participation of farmers and ranchers was a real inspiration.

The NASCD program opened on Sunday evening, January 31, with an impressive program on soil stewardship. An attractive and impressive brochure "The Spirit of the People," will be used during Soil Stewardship Week, May 22-29, 1960. The NASCD-sponsored film, "The Earth Is the Lord's," had its premier showing at the soil stewardship ceremonies. This is an excellent film which will be most useful in revealing to many U.S.A. people, rural and urban, the importance of soil and water conservation.

—SCSA—

It has been said that America is "the pantry of a starving world." The Constitution, framed in 1787, points out that ours is "A government of the people, by the people, and for the people." The phrase, "the people" is used often in the Declaration of Independence (1777) and the Constitution (1787). Agriculture, and with it soil and water conservation, has been given a "black eye" and put in the "dog house" by improperly reporting the farmers' position and problems in relation to our national economy and by reporting as costs of agricultural programs everything from school lunch programs, foreign aid, storage charges, etc., as subsidies for farmers or as conservation costs. Is a free market the best solution to the farm problem? Must three-fifths of the present farmers leave the land so that we may have a healthy agriculture? In another ten or twenty years are another three-fifths or more of the farmers slated to go and so on until a few giants run the "farm show"? What will be the ultimate effect on farm and ranch resources, production and food prices, and on people?

We must remember that a farm and ranch is not just a food factory—it is also a home for a family. *People are important*—more important than livestock, crops, machinery and money. It would be most gratifying if the press would report accurately all subsidies, both hidden and obvious, enjoyed by utilities, manufacturers, publishers, airlines, and others, and recognize the importance of farmers, ranchers and their families as people of these United States of America.—ELMER L. SAUER, *President*.

WATER CONSERVATION STAMP

The U. S. Post Office Department, on April 18, 1960, will issue a 4-cent postage stamp commemorating the urgency of water conservation. The nation's first water conservation stamp will be formally released in ceremonies to be held in Washington, D. C., in connection with the 7th National Watershed Congress. The water conservation stamp, a companion to the soil conservation stamp issued last year, will be printed in the quantity of 120 million.

Information and price lists for Official First-Day covers can be obtained from the Washington Press, 43 Williams St., Newark 2, New Jersey, and the Fleetwood Cover Service, Pleasantville, New York. The Watershed Congress has arranged with these two companies to print First-Day covers. Inquiries should be addressed to them.

NEWEST SOCIETY PUBLICATION NOW AVAILABLE

THE LATEST in a series of professional publications published by the Society is **Snow Surveys and Water Supply Forecasts.**

The five papers included are from the Snow Survey Panel program presented August 27, 1959, during the 14th annual meeting of the SCSA at Rapid City, South Dakota. They are: *"Objectives, Conduct, and Techniques of Snow Surveys"* by R. A. Work and M. W. Nelson; *"Agricultural Uses of Snow Surveys and Seasonal Water Forecasts"* by J. R. Barkley; *"Uses of Snow Surveys in Reservoir Storage Control, Energy Generation, and Flood Mitigation"* by H. A. Shamberger; *"Can Water Forecasts Be Refined?"* by H. G. Wilm; and *"Push Button Snow Surveying Research Needs and Progress"* by C. C. Warnick.

There is an introduction by Carl B. Brown who moderated the original panel program and a *"Further Reading List"* of 29 titles.

The 20-page proceedings 8½ x 11 inches is self-covered with an attractive front-page design prepared by Felix Summers.

Copies are available at the given prices. All prices include shipping expenses.

1- 9 copies	$0.50 each
10-24 copies	.45 each
25-49 copies	.40 each
50-99 copies	.30 each
100 or more	.25 each

Orders should be placed with and checks made payable to *The Soil Conservation Society of America, Inc.,* 838 Fifth Avenue, Des Moines 14, Iowa.

In addition to the JOURNAL, the previous professional or special SCSA publications which are still available include: **Glossary** ($1.00); **Our Watershed Resource** ($0.50); and **Land Utilization in the United States** ($0.50).

LETTERS

JOURNAL DISPLAYED IN INDIA

[From a letter to D. Harper Simms, Information Director, Soil Conservation Service, Washington 25, D. C.]

Like a long lost cry from the jungle I report on a letter you got May 15, 1959, from the Editor of the JOURNAL OF SOIL AND WATER CONSERVATION.

With that letter, he forwarded you a copy of the JOURNAL suggesting that some issues be on display here at the Fair. I have put the March '59 issue on display in our Library-Conference room to carry out at least part of the Editor's request. In fact, this one issue is about all we have had room for.

This reference-conference room is being increasingly put to use, particularly by Milton Norland of ARS who is getting a lot of questions on soil, conservation, and irrigation, in addition to his regular area of fertilizers. For example, Milton has a discussion group of about 40 coming in this afternoon to cover soil and land use. He is already a prime target for the professors at the Indian Agricultural Institute to give them some help.

Perhaps he will feel better after the conference today when our crowd will be down in the area of around 15,000, compared with the feeling of frustration yesterday when almost 90,000 came through to look and be moved on. Milton is having quite a time also deciding who can have a copy of his limited supply of the two USDA Yearbooks, "Soil" and "Water." If you want a visual experience sometime, come to the Fair in a Far Eastern Country.

J. H. MCCORMICK
United States Exhibit,
World Agriculture Fair,
New Delhi, India.

VOTED FOR FONDA'S ARTICLE

To the Editor:

In the balloting for the best JOURNAL articles of 1959, I selected Morris Fonda's article, "Industry's Role in Conservation," (March, 1959). Mr. Fonda touched on some vital points. He challenged industry to awaken to a wiser use of natural resources. He urged industry to assist conservationists in the education of workmen who gain their livelihood from industry, and the public which depends upon industry for manufactured products. Fonda's article raised for me many questions: Do citizens realize the importance and scope of conservation of soil and water and related resources? Does industry realize its great opportunities in helping to bring about this awareness?

People Not Too Deeply Disturbed . . .

In my home town of Lafayette, Indiana, for example, people seem to become concerned about water only during a drouth and when the mayor proclaims city water shall not be used for sprinkling yards or washing cars. There is mental disturbance, too, when floods on the Wabash river close roads and bridges to traffic—and over the past two years we had nine floods. There seems to be easy forgetting once the emergencies are passed. But in the meanwhile, what has been learned about the fact that 24,000 acres of good agricultural fields were under water and crops destroyed? And, what was learned about the reduction in buying power of farmers whose lands had been flooded?

Farmland Sacrificed . . .

I have also learned through some land-use surveys I made in 1959 in the Tippecanoe Soil Conservation District that in the past 15 years about 10,800 acres (almost half a township) of farmlands have been diverted to non-farm use. When zoning was applied, not too much attention was paid to land use and to the fact that some of the land taken out of farming was the most valuable agricultural land in the county.

Beauty Is Being Destroyed . . .

During my travels, I have seen evidence of "spent splendor": Ghost towns in the coal mining area of southeastern Indiana; the destroyed "Hunters' Paradise" of the Kankakee River marshes; worked-out iron ore mines in Minnesota; exhausted gold mines in Nevada; cut over and burned forest lands in Wisconsin and Michigan; barren and highly-eroded Ducktown, Tennessee, where copper had been smelted; and the despoiled "Paint Pot" in Yellowstone National Park. These were things I hated to see; here was destruction of beauty in nature.

Morris Fonda has given us a very real challenge.

—JESSE G. ZIMMERMAN,
Lafayette, Indiana.

[Mr. Zimmerman has been connected with Soil Conservation Service since 1933 and worked in the Tippecanoe Soil Conservation District from 1943 to present, first as Work Unit Conservationist and now as Soil Conservationist.]

JUDGING GOES INTERNATIONAL

More than 20 states are expected to take part in an **International land, pasture and range judging contest,** April 28 and 29, in Oklahoma City. Twenty-five representatives from 12 foreign nations have indicated they will participate.

Objective of the event is educational work in soil and water conservation, pasture development and native grass management.

The six divisions in the contest include adults, 4-H, FFA, women and girls, collegiate and foreign.

Write Edd Roberts, Extension Soil Conservationist, OSU, Stillwater, Okla., for free brochure giving full details.

PLAN NOW TO ATTEND THE SOCIETY'S 15th ANNUAL MEETING AT GUELPH, ONTARIO, AUGUST, 28 TO 31.

Plans Shape Up for 15th Annual Meeting

. . . If you plan to attend, have you filled in the Advance Registration Form and sent it in?

OUR Society President, Dr. E. L. Sauer, attended the annual meeting of the Ontario Chapter at the Ontario Agricultural College at Guelph, Canada, on January 23, to hear the convention committee's plans and to see the fine facilities at the College for the 15th Annual Meeting of the Society on August 28-31.

Travel Connections

Convention delegates can reach Guelph by car, bus, train or plane.

Automobile travellers will cross the border at Niagara Falls, Windsor, Sarnia or Sault Ste. Marie. Information on routes and accommodations along the route can be obtained at the tourist information booth at each entry point.

Those coming by air should secure tickets to Toronto-Hamilton airport, at Malton, forty miles from Guelph. The Ontario Chapter will provide courtesy transportation to Guelph for those indicating on their pre-registration form their intention of traveling by air.

Guelph is served by two major railroads, Canadian National and Canadian Pacific, and is on lines between Toronto and Port Huron and Detroit.

There are convenient bus schedules between Detroit and Toronto via Greyhound lines, with transfer at Hamilton directly to Guelph by Canada Coach Lines. This line also provides direct service from Niagara Falls and Buffalo to Guelph.

Accommodation

The tourist season will be making heavy demands on the local hotels and motels. The operators of these establishments have assured us that accommodation will be available for those who REGISTER IN ADVANCE.

The Committee is planning to house those members who bring their families, in the College dormitories unless you specify otherwise. We have been assured of 750 beds on the campus, (no maid service), usually 2 to 4 per room. The College charges $1.50 per bed per night. Local hotels and motels, within 15 miles of Guelph, can handle around 1,200 people.

(Please continue on bottom of next page)

ADVANCE REGISTRATION FORM

Soil Conservation Society of America, 15th Annual Meeting, August 28-31, 1960

NOTE: PLEASE RETURN BEFORE

July 1, to Soil Conservation Convention, Department of Soils, Ontario Agricultural College, Guelph, Ontario, Canada

Name _____

Address _____

_____

Chapter _____

Accompanied by Wife _____ **Children (No.)** _____ **Ages** _____

Do you expect to register on Sunday _____ **or Monday** _____

Desire accommodation at College Residence _____ **Motel** _____ **Hotel** _____

Camping _____

For Sunday _____ **Monday** _____ **Tuesday** _____ **Wednesday** _____ **nights**

Making own arrangements _____

Travel by Car _____ **Bus** _____ **Train** _____

Plane _____ **(advise) Flight No.** _____ **Date** _____

Originating from City of _____ **to Malton Airport, Toronto**

SPECIAL EVENTS **(please indicate number attending):**

1. Conservation Tour (Tues. Afternoon, Aug. 30) _____

2. Ladies Tours (Hamilton Tour) _____

(Guelph Tour) _____

3. Shakespearean Festival (Wed. Evening, Aug. 31) _____ **(Please indicate number attending)**

ENROLLMENT TRENDS IN USA COLLEGES OF AGRICULTURE

—an education and man-power feature

Condensed from address presented to the Scientific Manpower Commission, Washington, D. C., November 4, 1959, by Roy M. Kottman, Dean, College of Agriculture, Forestry and Home Economics, West Virginia University, Morgantown, West Virginia.

ENROLLMENT in Agriculture in USA Land-Grant institutions since 1951 has barely held its own, and, in many institutions, has consistently declined while total enrollment in those same institutions was making sizable gains. Such a trend in college enrollments has serious implications for agriculture in terms of legislative appropriations as well as budgetary allocations by college and university administrative officials. Likewise, there are serious implications in terms of prestige of students and of graduates in those disciplines where enrollment is slipping.

Bold Action Needed

Leaders in colleges of Agriculture and throughout industry and government are becoming increasingly aware of the need for bold and decisive action if colleges of Agriculture are to serve the citizens of this nation in fact as well as in name. We must take immediate action to bolster declining enrollments in colleges of Agriculture and to make those curriculum changes which will enable us to be of maximum service to the nation in the dynamic era which faces us.

From the standpoint of long-term effects, the fact that we are graduating fewer students from colleges of Agriculture means that many positions in agricultural business, industry, services and in agricultural education are being filled by people who are not well qualified for their jobs. Hence, the prestige and welfare of those businesses, industries, agencies and institutions suffer relative to other areas that are able to fill their needs with highly capable people trained specifically for their particular jobs.

Declining Enrollment

In the fall of 1956-57, for example, there was an increase of 2.6 per cent in Agriculture enrollment but a 4.8 per cent increase in total undergraduate enrollment. Agriculture enrollment decreased in 22 of the 51 (white) Land-Grant institutions in that year.

In 1957-58, Agriculture enrollment decreased 2.7 per cent; total enrollment increased 1 per cent. Agriculture enrollment declined in 35 of the 51 institutions.

In 1958-59, Agriculture enrollment decreased 2.7 per cent; total enrollment increased 1.5 per cent. Agriculture enrollment declined in 28 of the 51 institutions.

(Please continue on next page)

GUELPH MEETING SHAPES UP

If you prefer to see more of Ontario, then we can locate an additional 500 people within 20 miles of Guelph. To be assured of the type of lodging you want use the pre-registration form in this issue of the JOURNAL.

For those who plan to spend part of their vacation prior to or following the Meeting, please write to the Ontario Department of Travel and Publicity for information on camping facilities, resorts and Provincial parks. If you plan to camp while attending the Meeting be certain to write to Mr. G. M. Coutts, Grand Valley Conservation Authority, 27 Dickson Street, Galt, Ontario. There are a limited number of overnight camping areas within 12 miles of Guelph which will be available by reserving the space with Mr. Coutts as early as possible.

The Facilities at the College

The meetings will be held in the new Physical Education Building on the College Campus. This modern building has seating accommodation for 2,000 people, a cafeteria, meeting rooms, exhibit rooms and swimming pool. Breakfasts and lunches will be served in the College Dining Hall. Evening meals are a special feature and will be served in the Physical Education Building.

The exhibits will be an interesting feature and will include displays on Agriculture and Forestry by the Department of Agriculture and the Department of Lands and Forests. The River Valley Conservation Authority Program in Ontario will be displayed by the Ontario Department of Planning and Development and the Grand Valley Conservation Authority. The Federal Department of Northern Affairs and National Resources will have an exhibit on Canada's Northland and the development program. Many industrial firms who are interested in the vital role of resource management will have educational exhibits.

Other Information

Stratford Shakespearian Festival

Delegates may wish to attend the Stratford Shakespearian Festival which is held during the summer months at Stratford, Ontario, some 45 miles from Guelph. The Stratford Festival has been given international acclaim for its productions of Shakespeare. For 1960 the famed director, Tyrone Guthrie, and actress Julie Harris will work in such productions as *Romeo and Juliet* and *A Midsummer Night's Dream*. Indicate on the advance registration form if you wish to attend the Festival. It is planned to reserve a block of seats for Wednesday evening.

Canadian National Exhibition

During the latter part of August, the Canadian National Exhibition is held in the 350-acre exhibition park in Toronto. This, the world's largest annual exhibition, is called the Show Window of Canada. It features displays of the nation's agriculture, manufacturing and resources as well as musical and sports events, and an outstanding grandstand show.

To Help You Plan

1. Registration will commence Sunday afternoon and to be followed by the LONGTIME SUPPER from 5:00 to 8:00 p.m. in the Physical Education Building and an evening of entertainment.
2. Monday—sessions in the morning and afternoon with the UPPER CANADA PROGRAM in the evening.
3. Tuesday—sessions in the morning; box lunch while on the afternoon tour; Old Ontario BARBECUE at night with entertainment.
4. Wednesday—sessions in the morning; business meeting in the afternoon.
5. Ladies program for Monday and Tuesday includes special shopping tours for woolens, china and linens; visit to the Botanical Gardens, and homes well-known for their architectural design. There will be coffee and tea parties.
6. Children's program—under the direction of trained personnel during the sessions. Sitters available for evenings.
7. Recreation facilities available on the campus include a swimming pool with life-guards, and tennis courts. A pay-as-you-play golf course and riding horses are near by.

Agriculture enrollment as a per cent of the total enrollment in the 51 (white) Land-Grant colleges and universities declined from 11.63 per cent in 1951-52 to 8.03 per cent in 1958-59.

In a 1957 study[1] of Animal Husbandry students, reports were received from 19 institutions providing data on the 1956-57 ACE scores of entering freshmen. About two-thirds of the Animal Husbandry students beginning their studies in the Fall term, 1956, were in the lowest half of the distribution of all freshman students entering those Land-Grant colleges and universities. Approximately three-fourths of this same class of entering students fell below the 60th percentile. This would indicate that at least Animal Husbandry is not competing successfully with other curricula for students with superior ability. Further, there is at least a modicum of evidence that the same could be said for the majority of other disciplines in Agriculture.

Pitch Instruction Level Higher

The failure of Agriculture colleges to attract their share of top-notch students would indicate that we are probably being forced to pitch the level of our instruction to the average level of intelligence represented by students whose abilities place them approximately in the 40th percentile. It may also mean that we are inadvertently doing a grave injustice to the small group of our students who possess really outstanding mental capacity.

Agriculture Needs More Trained Workers

These facts of declining enrollment and of our failure to attract the more capable students would seem to indicate that Agriculture is a declining industry. This obviously is not the case when we consider that Agriculture is currently called upon to supply food and fiber for 1,300,000 more persons each year than there were the year before here in the United States. Population estimates are that there will be 228,000,000 in the United States by 1975—an increase of nearly 2 per cent a year for the next several years. When we couple these facts with the knowledge that nearly two out of five of our employed labor force work somewhere in Agriculture, it is quite obvious that the problem lies not with the demand for employees in Agriculture but with our methods of recruiting, with our program of education in Agriculture, and with our placement techniques.

We have failed to communicate with the general public so as to enable them to differentiate between the terms "farming" and "agriculture." I think all of us have heard a great many high school students say, "I don't want to study Agriculture because I am not going to be a farmer." Young people and their parents just do not realize that for every farmer there are at least two other people in Agriculture who work off the farm—who are not farmers at all, but who are, none-the-less, engaged in Agriculture—in the work of marketing, transporting, processing, packaging, storing, wholesaling and retailing food and fiber—bringing it from the producer to the ultimate consumer. Two out of three engaged in Agriculture live in cities and towns!

Demands Not Being Met

We offer courses and curricula which are supposed to supply the right kind of education for people in Agriculture, but are we really providing the right kind of graduates that business and industry want to hire? Certainly we are not attracting enough students into our Agriculture curricula to fill more than a third to a half of the potential demand. For example, Assistant Dean Chester Hutchinson at Ohio State University conducted a survey[2] two years ago in which he found that a sample of the firms in the seed trade wanted to hire 520 Bachelor of Science graduates in Agriculture. They were able to secure only 152. Another survey involving 14 companies among the food processors wanted to hire 147 Bachelor of Science degree people in Agriculture. They were able to find only 68. From these and other bits of data which have been gathered from time to time, there is an indication of two or three potential jobs for every graduate from our colleges of Agriculture.

Unfortunately we do not have comprehensive surveys of all areas which employ Agriculture graduates. It is possible that these estimates of two or three jobs for every graduate may be in error by a factor of 50 to 100 per cent. We just don't know either the direction or the magnitude of the error in these estimates. We need research information concerning how many jobs there are, what these jobs are, what type of college training best prepares for the jobs, and, finally, how we can best serve all of the businesses, industries, agencies and institutions interested in hiring the graduates of Agriculture colleges. In short, we urgently need a carefully conducted, comprehensive study of the recruitment, education and placement of Agriculture students.

National Survey Initiated

Action has been initiated to undertake a nation-wide study of the recruitment, education and placement of Agriculture students. The Association of Land-Grant Colleges and State Universities has appointed an agribusiness subcommittee and charged it with developing a research proposal and with actively seeking funds for carrying out the research program involved therein.

Perhaps the Land-Grant Colleges of Agriculture cannot be blamed too much for a reticence toward curriculum changes which would have made it even more difficult for less capable students now studying Agriculture to complete their work. To have done so would have further reduced enrollments at a time when there are, conservatively, two jobs in Agriculture for every one of our graduates.

FLASH: Reporting on Dec. 16, 1960, the American Society of Agricultural Engineers stated that since July 1, 1960, the ASAE's personnel department had listed 110 openings for agricultural engineers and had found only six men to fill the openings. Plans of ASAE now call for on spot employment interviewing during stated meetings; a drive to get companies employing agriculture engineers to list suggestions to help publicize career opportunities; and preparation of a film designed to create interest on a high school level in agricultural engineering as a career.

FLASH: At the December 1960 ASAE meeting, L. E. Grinter, dean of the Graduate School of the University of Florida, Gainesville, emphasized that colleges of agriculture must change their traditional objective of training farmers and accept their new role of producing applied scientists for agriculturally based industry and other agricultural agencies. By so doing this, the colleges will draw increased numbers of students and compete on a favorable basis for the best students with engineering, medicine and other professions.

"The training of small business farmers," said Dean Grinter, "does not have a clearly professional objective. Hence it will not compete with the professions when a shortage of scientific talent exists." He also pointed out that curriculum adjustment is needed to increase requirements in mathematics to include calculus and statistics.

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[1] *Kottman, R. M. 1958. Reorientation and Modification of Objectives in Animal Husbandry Curricula. Journal of Animal Science, Vol. 17, No. 3, August.*

[2] *Hutchinson, Chester S. Personal Communication, 1958.*

CHAPTER NEWS

South Alabama chapter met in Greenville, Dec. 4, for its annual get together. T. J. Walkup, P. O. Box 311, Auburn, Ala., is secretary-treasurer.

California chapter held its second annual meeting with all six of its sections represented at Stockton, Jan. 13, in cooperation with the California Association of Soil Conservation Districts. In addition to a business session, the program included papers and discussions on woodlands, wildlife, water, multiple-use management of national forest lands, and a report on use of Lana vetch. Dr. Daniel G. Aldrich, Jr., dean of agriculture, University of California, gave the banquet talk on "The importance of the professional and the layman in agriculture." Out-going chairman, Sven G. Anderson, reported on the accomplishments of 1959. The six sections had an opportunity to present their 1959 accomplishments. *Run Off* is the name of the chapter's newsletter which appears bimonthly and alternately to the JOURNAL.

Hoosier chapter continues to communicate well through its newsletter. "Urbanization problems" was the theme of the annual meeting Jan. 8 at Purdue University and featured SCS Administrator Don Williams and Elmer Sauer, SCSA president. *A copy of meeting proceedings, including all the talks, is being sent to all who paid 25 cents.* Harry Galloway, Purdue University (chairman), Ward Studor, and C. E. Swain have been appointed to the local arrangements committee for the 16th annual meeting of SCSA to be held at Lafayette, Ind., in 1961.

Egyptian chapter (Illinois) met March 11 at Southern Illinois University with a panel discussion on "Planning as a key to rural land use." The panel, moderated by H. E. Gearhart, included five discussors representing a Planning Consultant company in St. Louis (G. K. Rohrbach); Southern Illinois University (William Winter, Frank Kirk and Frank Thomas); and the SCS (James Gillooly). Goals for 1960 were also discussed.

Northern Illinois chapter, according to information received from several out-of-state Society visitors, held "one of the best chapter meetings we've attended anywhere" on Nov. 12 at the University of Illinois. A copy of the program and the covering Newsletter (No. 16, Dec. 4, 1959) are available on request and worthy of examination. (Write to H. R. Beeson, 425 South Siegel, Decatur, Ill., if interested.) Urban sprawl and regional approach to resource planning were the meat of this 6th annual meeting and the topics of two panels. Herbert B. Eagon, director, Dept. of Natural Resources of Ohio, was the banquet speaker.

Kansas chapters were active with **Bluestem Hills** chapter meeting Dec. 5 at Eureka to elect 1960 officers and enjoy a slide talk on the Holy Lands by the Rev. Mr. Bob Williams; the **High Plains** chapter met Oct. 23 at St. Francis to honor essay contest winners and hear Fred J. Sykes; the **Pony Express** chapter held its annual meeting at Leavenworth, toured the local Fort, summarized accomplishments for 1959, and elected officers for 1960; the **Salina** chapter met Dec. 4 and were treated to a slide report from Les Johnson and Dewitt Abbott on the Rapid City meeting of SCSA.

Bluegrass chapter (Kentucky) met Sept. 25 in Frankport at the office of Marshall Qualls and toured the division offices of Kentucky Dept. of Conservation and heard brief summaries from division heads on their work, and later visited the Dept. of Fish and Wildlife game farm, followed by a dinner meeting.

Louisiana chapter received its charter as an SCSA chapter and held an excellent two-day meeting Jan. 29-30 at Shreveport with 120 members and guests in attendance. A field trip to a unique small watershed at Plain Dealing occupied the attention of members all of Friday morning. Water, soil, forest, and wildlife topics filled the remaining sessions. Wayne Pritchard, SCSA executive secretary, described the aims and goals of the Society. Marion Monk, treasurer of the NASCD, was one of the featured speakers. Thus the Louisiana chapter was off to an excellent start that points to its becoming a strong force for conservation.

Michigan chapter met on Feb. 4 at Michigan State University, East Lansing, with much emphasis on Society affairs and a talk by Elmer Sauer. Professional improvement, better communication with an audience, and techniques of using slides were other topics included. The chapter is going into its 7th year of an FFA activity program with 48 FFA chapters already entered.

Minnesota chapter met at Morris on Oct. 16 and participated in the dedication and tour of the ARS Soil and Water Research Laboratory. The Newsletter described a very successful and unique 12-car caravan tour for two days en route to Rapid City SCSA 1959 annual meeting. The chapter's annual meeting was held Feb. 20 on the St. Paul campus of the University of Minnesota. Dr. George A. Selke was the feature speaker and discussed competitive demands for water. Eight out of 12 members of a recently appointed Minnesota Governor's special committee on water resources are members of the chapter. The committee will attempt to coordinate state-wide problems in water management, and will be chairmanned by Dr. Selke. The newsletter continues to cover many activities of members, publications, meetings, and research and conservation projects statewide.

Mississippi chapter paid attention to the subject of the "Role of government in soil and water conservation" at its annual meeting Nov. 17 at Jackson. Selby Bowling, president of the state Association of County Supervisors (the county level); Heber Ladner, secretary of state (the state level); and Thomas G. Abernethy, member of congress (the national level), were the main speakers. President of the chapter, C. W. Steadman, presided.

The East Central Area of the chapter attracted 91 to a meeting Aug. 21 at the Coastal Plain Branch Experiment Station. On Sept. 18, Earl E. Freeman, president of the East Central Area presented a plaque to Hugh Mitchell, first place winner of the soil and water division at the annual Conservation Boys' School held at Roosevelt Park near Morton. The school attracts about 200 carefully-screened boys who come for a week of training in conservation topics and projects. It is sponsored by the Mississippi Forestry Association.

[EDITOR'S NOTE: Additional chapter news items were received but space limitations make it necessary to consider these for another issue. News items, including a number of Newsletters, have been received from **Missouri, South Central Nebraska, Lincoln** (Nebraska), annual meeting of all **Nebraska** chapters, **New Jersey, Empire State** (New York), **North Carolina, Oklahoma Council of SCSA chapters, All Ohio, Oregon, Rutgers Student Chapter, South Dakota, East Tennessee, Heart of Texas** (chartered December 18 at Temple), **Fort Worth** (Texas), **Corsicana** (Texas), **Southern New England** (R. I., Conn.

and Mass.), **Inland Empire** (Washington and Montana), **Olympic View** (Washington), and **Wisconsin.** Early in November the Society's executive secretary, H. W. Pritchard, visited the Oregon, Olympic View and Inland Empire chapters.

With a great increase in activities among the some 98 active chapters of the Society, chapter news reporting is due for study.

KANSAS CHAPTERS TO MEET

A state-wide meeting of the **Kansas Chapters of SCSA** has been set for May 20-21, 1960, at Hays, Kansas. This will be the first time for such an all-state meeting. Members are urged to attend. Sessions will be held in the Memorial Union Building on the campus of the Fort Hays Kansas State College. For further information write Bert Soderblom, P. O. Box 636, Hays, Kansas.

Soil Stewardship Week for 1960 begins Sunday, May 22, and continues through Sunday, May 29. For various aids and prices (booklets, church programs, posters) and information on new film, *"The Earth Is the Lord's,"* write to NASCD Service Dept., League City, Texas.

NEWS OF MEMBERS

G. Claire Herting, Norwich, New York, work unit leader for the SCS, was one of the ten professional conservationists recognized nationally this year and honored by an American Motors Conservation award which included a walnut and bronze plaque and $500.00. The award was presented to Herting during the Feb. 2, 1960, meeting of the Empire State SCSA Chapter by **Harry Porter,** chapter chairman.

Fred Larson, formerly with the SCS EWP office at Upper Darby, Pa., has accepted an appointment with the U. S. Study Commission, Southeast River Basins, with offices in Atlanta, Ga.

Harry A. Kerr, extension professor at Cornell University and a long-time member of the Society, spent two months this summer in California. Even though it was a family vacation in a way, replete with a trailer, Harry looked into water laws, water rights, and irrigation.

Walter Humphrey, editor of the *Fort Worth Press* (Texas) and an honorary member of SCSA, was recently made the first honorary Soil Conservation District Supervisor in Texas. At the January meeting of the Texas SCDs, a plaque was presented to Editor Humphrey.

Harlon H. Backhaus, formerly assistant state conservationist for SCS in Iowa, is now serving in a similar position in Minnesota.

Roy M. Kottman, former Iowan, and now dean and director of Agriculture, Forestry and Home Economics and the Agricultural Experiment Station at West Virginia University, Morgantown, will become dean and director at Ohio State University, Columbus, on June 1, 1960.

H. M. Wilson of the Empire State chapter is one of the authors of Cornell Extension Bulletin No. 1031 on plowplant corn.

Joe F. Carber, former chairman of ASC in Iowa, has been named sales director of the Farm Grain Storage Division of Abild Construction Co. of Des Moines.

"And when you need nitrogen you need **ViTREA"**

"And remember, son, a good farmer uses his time wisely . . . takes care of his equipment . . . follows soil test recommendations . . . and, when extra nitrogen is needed, he uses Vitrea."

SEE YOUR DEALER TODAY AND ORDER YOUR SUPPLY OF **VITREA**

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Grand River Chemical Division of
DEERE & COMPANY
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Test Yourself on Magnesium

Widespread shortages of magnesium are a fairly new problem in some parts of the United States. The shortage may now be beginning in your area. Be sure you can recognize it. These questions are designed to help bring you up-to-date.

1. Magnesium deficiencies usually show up in the leaves of the plant before serious damage has been done to the yield.
   True **False**
2. Magnesium deficiencies are most apparent in.....
   .....
   a. Root Structures **b. Leaves** **c. Stems**
3. Seed development often requires more magnesium than .....
   a. Nitrogen **b. Phosphorus** **c. Potassium**
4. Soil bacteria growth is stimulated by magnesium.
   True **False**
5. Magnesium availability in the soil is not affected by the amount of available calcium.
   True **False**
6. An application of magnesium limestone will not change the pH of the soil.
   True **False**
7. Yields are cut as a result of magnesium deficiencies because magnesium is a major element in seeds and fruit, and because magnesium acts as a carrier for another important element. That element is.....
   a. Phosphorus **b. Potassium** **c. Calcium**
8. Addition of high-analysis fertilizers containing sulfates, chlorides and nitrates helps to slow the loss of magnesium.
   True **False**
9. The greatest amount of magnesium is removed from the soil by leaching.
   True **False**
10. Water-soluble sulphate of potash-magnesia (Sul-Po-Mag) does not change the soil pH.
    True **False**

FOR THE CORRECT ANSWERS turn this ad upside down. If you answered 8 out of 10 questions correctly, chances are you are pretty well informed on the role magnesium plays in crop quantity and quality. If you had difficulty, you may be interested in sending for our booklet, "Magnesium."

Answers: 1. F 2. b 3. b 4. T 5. F 6. F 7. a 8. F 9. T 10. T

Products for Growth*

S·P·M PREMIUM

Quality fertilizer containing a combination of readily available magnesium and sulphate of potash obtained from Sul·Po·Mag

This identifying Seal of Approval is assurance of extra-value fertilizer.

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NEWS OF MEMBERS

Harry Slayback, New Jersey extension soil conservationist, was on the February, 1960, cover of *Better Farming Methods* along with three Jersey Scouts. The Boy Scouts of America are celebrating their 50th year of formal organization. Many SCSA chapters are engaged in active programs with Scouts. A very substantial number of SCSA members serve Scouting in several ways, but particularly as counselors in Merit Badge activities. Harry, through his state work and through cooperation with Scouting programs at a national training center located in New Jersey, has done a good job in helping to get conservation recognized strongly in the BSA program.

The 1959 distinguished service award of the NASCD was presented to **A. H. Settle,** director of the Goodyear Tire & Rubber Co. soil conservation awards program. Settle has been director of Goodyear program since 1954 and been responsible for stimulating much interest in conservation practices throughout continental United States.

A. H. Settle

Phil Barskey, a member of the Southern New England chapter, is serving on the chapter's wildlife committee. He is Northeastern representative of the Wildlife Management Institute.

Dr. and Mrs. **John Lamb** were honored guests at a retirement luncheon for John in Boston, Mass., last November. Dr. Lamb was appointed to the editorial board of the JOURNAL to serve for 1960-63; his retirement from SCS was effective Jan. 31.

H. Wayne Pritchard of Des Moines, Iowa, and **Tom O. Helm** of Louisville, Ky., were recently appointed to serve on the Central States-Forest Service Advisory Council.

Bernard Frank, formerly of the Forest Service and UN FAO watershed consultant in India since January, 1959, has been appointed visiting professor of watershed management for the spring quarter at Colorado State University, Fort Collins, Colo. He will teach a course in applied watershed management to seniors and graduate students.

A number of SCSA members in Virginia assisted on three short courses in conservation given for school teachers at Virginia Polytechnic Institute, William and Mary College, and Virginia State College this past summer. Those assisting were **Frank Carr, John Abernathy, Tullie Dean, John Clay, Carl Gregory, Dallas Adams,** and **W. A. Phillips.** All of these men are associated with the SCS in Virginia.

C. A. "Cy" Turo, Administrative Officer in the Illinois State SCS office, retired September 30 after more than 23 years of administrative and fiscal work for the Service.

R. J. Jeansonne, Soil Conservation Service technician, was a leader in the Upper Delta District, Louisiana, conservation district annual hardwood field day held September 1. **Marion S. Monk, Jr.,** member of the Upper Delta Soil Conservation District and treasurer of the NASCD, was the principal speaker at this meeting.

Richard Grob, a farmer in Kankakee County, Illinois, was elected president of the Soil Conservation District Association of Illinois. **Doren Bricker** and **Archie McIntosh** were re-elected as area vice-presidents. These men are all members of the Northern Illinois chapter.

Darnell M. Whitt, a member of SCSA, is now head of the Farm and Ranch Planning Division of the Soil Conservation Service, Washington, D. C. He succeeded **Val Silkett** who is now field representative for the Corn Belt.

John S. McVickar, professor and head of department of agriculture at Western Illinois University, and his brother **Malcolm H.,** chief agronomist for the California Spray-Chemical Corporation at Richmond, Calif., were featured as the "Agronomy Brothers" by **Milt Bliss** in the Winter 1959 issue of *Plant Food Review.*

Alvin C. Watson, Charles H. Callison, Dan W. Cannon, Delos L. James, Joe Penfold, Dan Poole, Harry E. Radcliffe, and Richard W. Smith are serving on the Awards Committee for the National Watershed Congress to select both the "Watershed Project of the Year" and the individual having made the greatest contribution. **Watson, Cannon, Radcliffe,** and **Smith** are SCSA members.

William R. Van Dersal was on a brief trip early this fall to England where he presented a paper on "Training Fieldmen in Radiation Monitoring in the U. S. Soil Conservation Service" to the FAO European Seminar on the Training of Agricultural Advisory Services on Agricultural Aspects of Environmental Radioactive Contamination.

A picture of **Dr. Lyle T. Alexander** and some lengthy quotes on his world wide experiences gathering soil samples was a part of an article on fallout in the September 5 *Saturday Evening Post.* Dr. Alexander is Chief, Soil Survey Laboratories, SCS, Beltsville, and works cooperatively with the Atomic Energy Commission.

Here's an efficient, economical erosion-control weapon . . .

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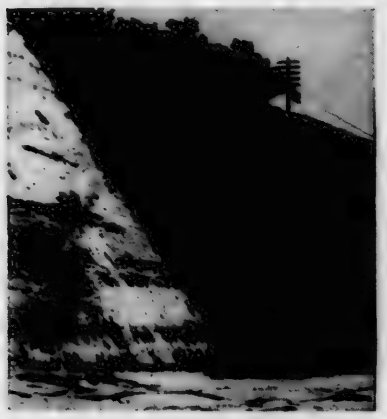
from minor slopes like this

to major ones like this



Bemis MULCHNET is your most satisfactory method of holding mulching materials in place. A wide-weave, twisted paper fabric, manufactured from high-quality natural kraft, MULCHNET offers these outstanding benefits:

Excellent weathering qualities — retains 50 to 75% of tensile strength when wet.

Selvage edges and center yarns (where material is stapled to ground) mildew-treated and reinforced for longer life.

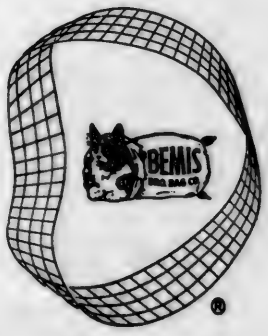
Holds mulch snugly in contact with soil through the growing season.

Does not have to be removed.

Quickly and easily applied; wire staples and special stapling tool available.

Economical—costs approximately 4¢ per square yard.

Write on your letterhead for a sample roll of MULCHNET for testing and also for a copy of EROSION CONTROL NEWS, loaded with information about the numerous benefits of MULCHNET.



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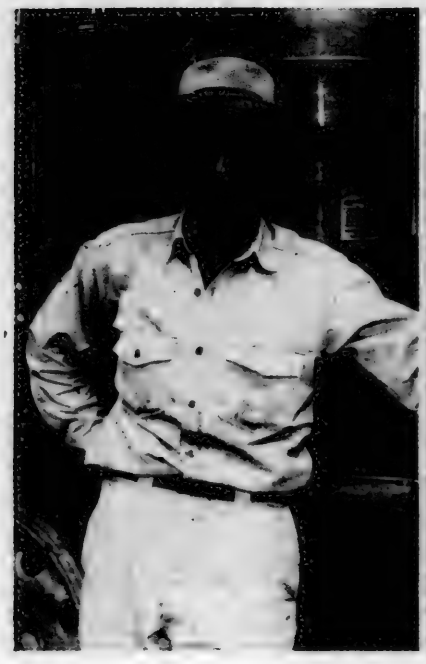

Oklahoma Conservation Contractor builds a mile of 2′ x 20′ terraces per day!

Terrace building is Ernest Bailey's business – a good business, and one he does well. Mr. Bailey's Cat No. 14 Motor Grader is ideally suited for building terraces in his community – and he keeps his machine busy doing it. His equipment is pictured at work here on the M. R. Mills farm east of Erick, Oklahoma. S.C.S. specifications on this farm call for a terrace base to be 20′ wide, 2′ high. Topography is rolling, with a 7% slope, and soil types are light clay and sandy loam, subject to erosion. Terraces are laid out about 150′ apart on this field to control runoff and prevent erosion.

Soil Conservation Service personnel lay out the terraces, and Bailey works the earth as illustrated here.

FIRST PASS

Channel is cut flat and the windrow is angled to the ridge side (see sketch). Second pass deepens the channel cut and piles more dirt on the windrow. Cutting the terraces is usually done in 2nd gear.

THIRD PASS

Power controls lower one side of the blade so that windrow is sloped up toward the ridge.

FOURTH PASS

Motor grader backslopes into the terrace channel. The windrow will be picked up and laid on the ridge on the fifth and sixth passes.

SEVENTH PASS

Cut is made on the outside slope, low side of the ridge.

EIGHTH PASS

Another cut is made from the center of the channel, leaving a windrow on the ridge side.

FINISHING PASSES

Windrow is smoothed out on top of the ridge.

This terrace is one of many types used in the U.S.A. Accepted terrace designs result from conditions and experiences in each locality. However, conservation contractors like Ernest Bailey find a Cat Motor Grader to be the most versatile and productive machine for a wide variety of terrace building jobs.

Here's how Mr. Bailey feels about it:

"I started in the terracing business 10 years ago – had always owned Cat No. 12 Motor Graders. I traded for the 150 HP No. 14, and it really does a job! It turns fast, and really handles tough dirt. The No. 14 does about 25% more than our previous No. 12. The weight, power and ease of handling are well balanced. Caterpillar equipment has always rated high with me!"

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NEWS OF MEMBERS

One of the two superior service awards presented by the USDA for 1958 was earned by the Marksville work unit in Louisiana. SCSA member **C. E. McClung** was a member of the work unit.

During this past September the Extension Service of Louisiana held a Watershed Protection Meeting for Agricultural Extension Workers and two members of the SCSA assisted on the program. These were **Alton Mangum,** watershed specialist of the SCS, and **O. O. Moore** of the Soil Conservation Service.

Ed Mundie, extension soil conservationist of Virginia, served as chairman of the half day session on soil and water conservation held at the recent Institute of Rural Affairs at V. P. I. This was the first year such a session was included in this Institute. The session was very well attended, with over 100 crowding the room and with some unable to get in.

M. B. Russell, head of the Agronomy Department, University of Illinois, and an active member in the SCSA, has recently returned from a mission to Afghanistan.

William Speer and his wife have returned to India, where he has accepted another two-year assignment in connection with the foreign aid program. Speer is a member of the Northern Illinois chapter.

Gladwin Young, a charter member of SCSA, is a member of the joint committee of the Department of Agriculture and Land-Grant Colleges on training for government service.

Charles A. Duncan, a native of Champaign, Illinois, recently returned to the United States from Korea. Mr. Duncan, an agronomist, has been serving with the International Cooperation Administration, advising the Korean Government on soil testing, farm management and soil improvement.

The following SCSA members are serving on the USDA Soil and Water Conservation Advisory Committee: **Wayne D. Criddle,** Salt Lake City, Utah; **W. J. Klein,** Milwaukee, Wis.; **Carl I. Peterson,** Nashville, Tenn.; **Firman E. Bear,** New Brunswick, N. J.; **T. R. Hedges,** Waterville, Wash.; **A. B. Holmes, Jr.,** Gallion, Ala.; **DeWitt Nelson,** Sacramento, Calif.; and **Arthur Sullivan,** Haxtun, Colo.

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1 **A "BONDED BUY"** in used Cat-built equipment is your best buy *anywhere.* This is an exclusive written guarantee bond, up to $10,000, assuring you parts and labor repair protection during the warranty period . . . similar to a new machine guarantee.

2 **A "CERTIFIED BUY"** covers units of any make in good condition. Machines with lots of life and profit left in them. This type of protection carries the dealer's written guarantee of satisfactory performance.

3 **A "BUY AND TRY"** deal is more than its name implies. It means a fair buy for the price asked. You are protected with the dealer's written money-back agreement. Something you won't get at most used equipment lots.

Only a Caterpillar Dealer will provide you with bonded protection, or written protection of any kind. He will also back you with prompt service and parts you can trust. You'll find a Cat Dealer listed in the Yellow Pages. Visit his used equipment lot for the best buys on the market. Compare his values with anyone else's . . . you'll soon join the family of satisfied Caterpillar customers.

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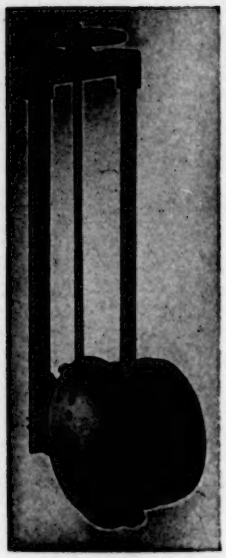

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Charles Butler, formerly associated with the American Farm Bureau Federation, has returned to government service as chief of the Land Branch, Division of Irrigation and Land Use, in the Interior's Bureau of Reclamation.

Bernie Peterson, a charter member of SCSA and a WUC at Ellsworth, Wisconsin, was winner of the Oliver Company 1958 Photo Awards Contest.

In an annual award sponsored by the Mason City Globe Gazette and KGLO radio and TV of Mason City, Iowa, SCSA member **Wayne Casey** received an award as an outstanding commissioner in the Soil Conservation Districts.

William R. Moore, a charter member of SCSA, is now Chief of the programming branch of the Watershed Planning Division of SCS with offices in Washington, D. C.

Fred Whittington, Range Specialist with the SCS at Elk City, Oklahoma, had a display of grasses and weeds constructed on a push button arrangement so that the name of the plant or grass will be revealed by a lighted bulb. This exhibit was designed to test a person's knowledge of grass and weeds and has been useful in fairs and other gatherings.

Herschel Newsom, Honorary Member of SCSA, has been one of the leaders of world farmers attending the International Federation of Agricultural Producers conference in New Delhi, India, this past November and December.

Maurice L. Dumars, a member of JOURNAL editorial board and formerly with the ARS Information Division, is now on the staff of the International Trade Fairs Branch, Foreign Agricultural Service with offices in Washington, D. C.

NECROLOGY

Palmer Sime, New York assistant state conservationist and active member of the SCSA, died February 27 at Syracuse after a coronary.

William Frank Purnell, Extension Soil Conservationist, University of Illinois, Urbana, Ill., passed away in his sleep January 31. Friends of Frank have made contributions to the Society's Building Fund in lieu of sending flowers. Frank was active in the Northern Illinois Chapter SCSA.

S. N. Boyd of Ripley, Miss. He was associated with the Soil Conservation Service and an active member of the Society.

Edward L. Lemke, a member of the Wisconsin Chapter, passed away early in January this year.

Changing Old Ideas on Earthmoving . . . .

"It takes heavy investment to get an efficient scraper of effective size."

"You need a stand-by pusher to get those heaped payloads."

"You have to sacrifice high maneuverability if you're going to get a scraper that really produces for you."

These old ideas are fading fast in the face of the performance of this John Deere-Hancock outfit.

First, compare the initial cost with other scrapers. See for yourself what you save in dollar outlay, keeping in mind you don't need a pusher tractor to give you a *fully loaded (7-1/2-yard) bowl every time.*

Then, consider the added working efficiency you get with the John Deere-Hancock unit which makes a complete, *continuous turn in less than a 30-foot width.*

Finally, you get that outstanding feature you are sure to want—*positive, hydraulic ejection*—which means a fast, easy dump in all soils.

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Just a reasonable amount down, and you can paint your name on the side of any John Deere Industrial Unit—put it to work earning the monthly or seasonal payments agreed on. All arrangements are made with the dealer in strict confidence.

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Baling and bale-handling by *one* man—made possible by a New Holland Super Hayliner 69, "50" Bale-Thrower and 750 Crop Drying Wagon.

A great new advance in mechanized haymaking:

"Hay-in-a-Day"... the ONE-Man Way!

Three major advances in mechanized hay handling will give farmers a faster, more reliable way of making excellent hay in the season just ahead:

Step 1: ONE-Man Baling and Loading!

Tests conducted at Penn State University reveal that, after mowing, conditioning and raking, a *bale-thrower* was used to automatically toss 16" bales into wagons built for drying. No longer was there need for one, two or even three men in the wagon stacking longer, heavier bales. Final results proved that baler plus bale-thrower increased baling speed at least 50%!

Step 2: ONE-Man Crop Drying!

The second big break-through came when tests at Penn State proved that bales thrown into wagons would dry as efficiently as stacked bales. Penn State used a shed system with a portable crop dryer supplying the forced hot air. Results showed less overdrying of the top half of the wagon when compared with standard-packed. Bales were more uniformly dense because the bale-thrower removed each bale as soon as it was made, preventing jamming on the bale chute.

Step 3: ONE-Man Storing and Feeding!

The third big break-through came with one-man handling of both storing and feeding of smaller bales. Here, for the first time in this system, hay is moved by hand—and then only into a conveyor. A false end-gate pulls the load to the front automatically. Inside the mow, bales are discharged to right or left at any point by maneuvering ropes from the ground.

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